
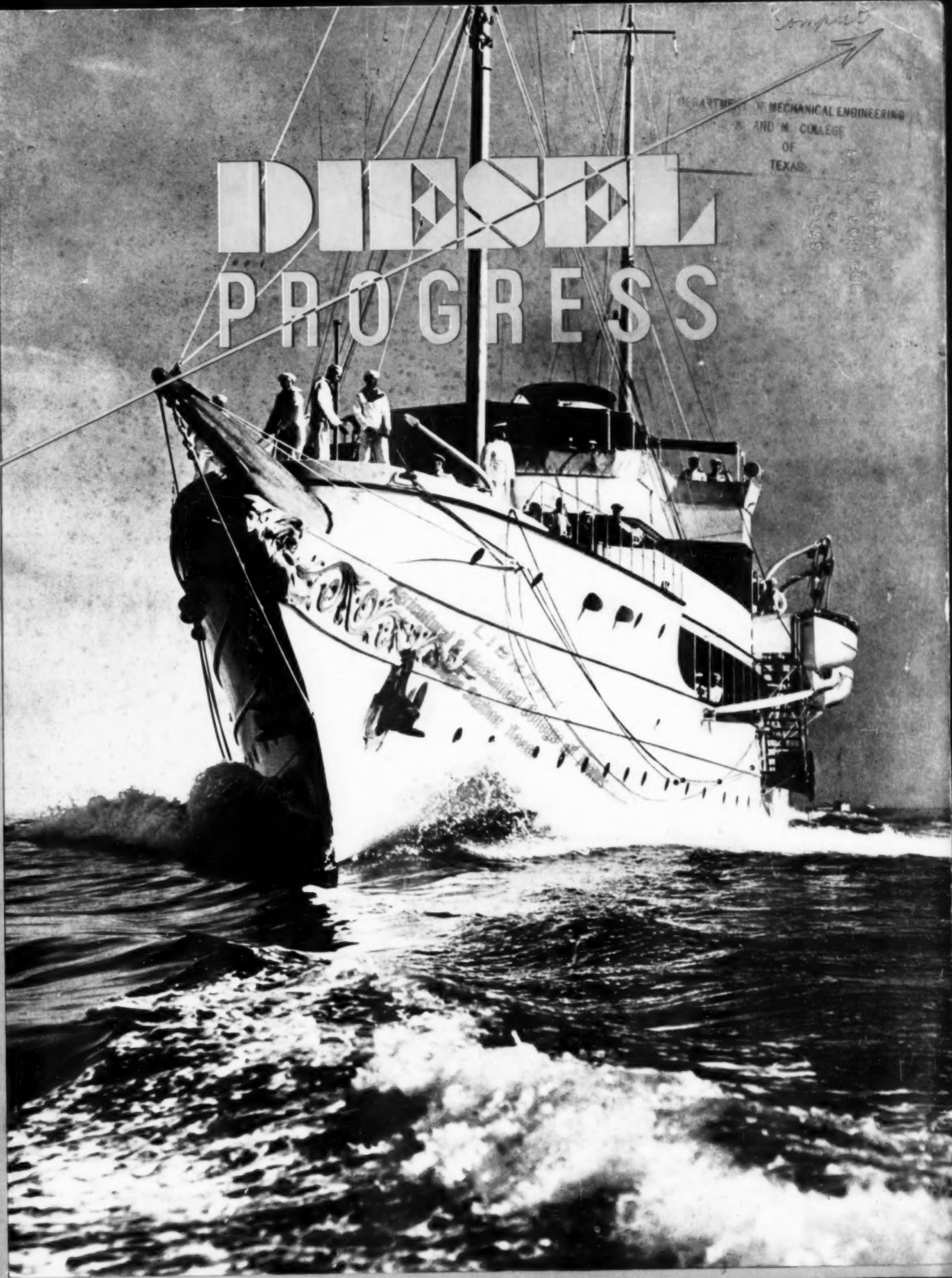


ON INDUSTRY  IN TRANSPORTATION • ON THE SEA • IN THE AIR 



JULY, 1938

CIRCULATION OF THIS ISSUE — IN EXCESS OF 14,000 COPIES

25c



Correct Lubrication

DEPENDABLE

...and Proved in Service...Socony-Vacuum's Correct Lubrication Raises Diesel Engine Efficiency...

HELPS OPERATORS SAVE ON REPAIRS AND MAINTENANCE

HERE'S THE POSITIVE, money-saving protection your Diesels need! It's called Correct Lubrication, and it starts with the *correct Diesel lubricants—Gargoyle D.T.E. Oils!*

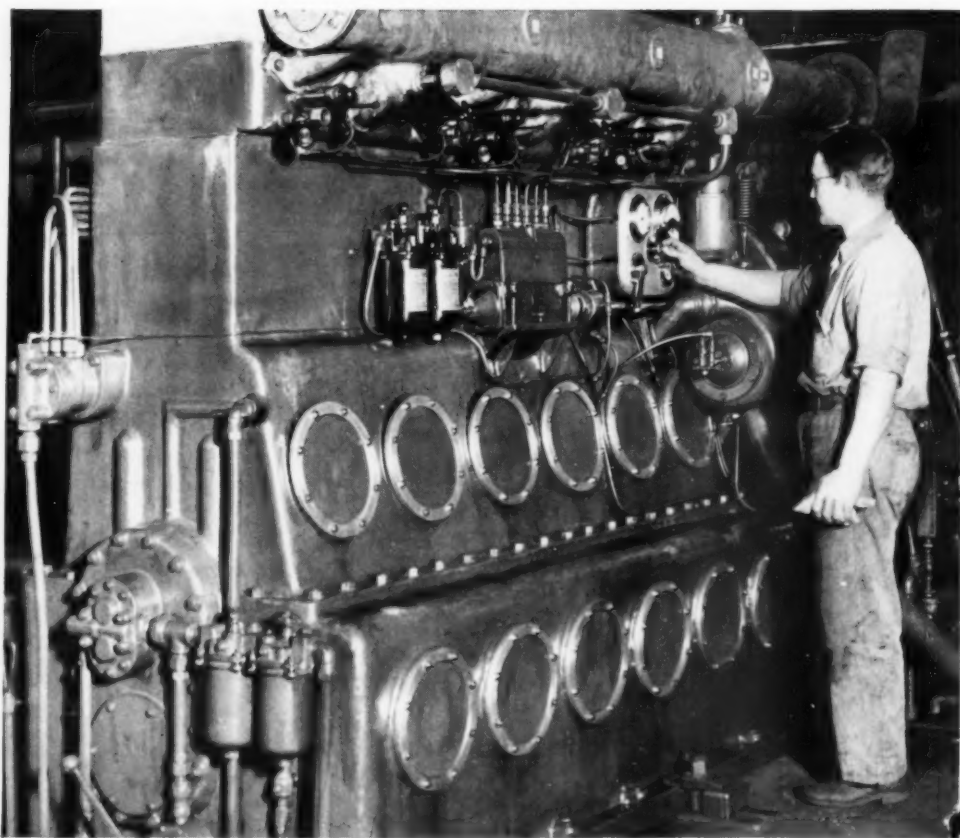
These oils are products of the greatest refining experience—the greatest Diesel lubrication experience—in the entire oil industry. They've won the endorsement of Diesel engine builders everywhere!

Gargoyle D.T.E. Oils have the body and film strength to give cylinders and bearings *full protection* from costly wear!

By resisting deposit formation they guard against stuck piston rings and sludge in the crankcase. This means *fewer engine cleanings...greater engine efficiency!*

Their stability and strength assure long life in the crankcase...*minimum oil consumption!*

Make these savings! A Socony-Vacuum engineer, backed by his company's vast experience in Diesel lubrication, will be glad to show you how Gargoyle D.T.E. Oils, *correctly applied*, will solve your lubrication problems... *give you new Diesel economies.*



SOCONY-VACUUM OIL CO., INC.

STANDARD OIL OF NEW YORK DIVISION • WHITE STAR DIVISION • LUBRITE DIVISION • MAGNOLIA PETROLEUM COMPANY
CHICAGO DIVISION • WHITE EAGLE DIVISION • WADHAMS OIL COMPANY • GENERAL PETROLEUM CORPORATION OF CALIFORNIA



MAKERS OF
MOBILGAS
MOBIL OIL
GARGOYLE
INDUSTRIAL
LUBRICANTS

A VIBRATION PROBLEM SOLVED

**Red River Refining Co. at Burnham, Ill.
had a real problem—read their letter.**

THE successful solution of the difficult problems submitted to us by the Red River Refining Company but typifies the type of work in which we specialize. Each problem is different, each problem calls for individual analysis and specific recommendations.

Hussman spring mountings are produced in various models to meet varying needs. On the basis of our investigation and analysis of your individual problem we submit recommendations as to the type and number of Hussman spring mountings the specific job will require. We then guarantee the result.

Red River Refining Company
PETROLEUM REFINERS
Chicago, Illinois
13921 Markin Avenue

SCHULZE VACUUM PROCESS
PATENTED

March 15, 1930

Carl Hussman, Engineers
120 South La Salle Street
Chicago, Illinois

Gentlemen:

We acknowledge receipt of your letter of March 11th, requesting permission to use one of the photographs of our Diesel Generator installation for advertising purposes. You have our unqualified consent to make use of any one or all of the photographs which we sent to you.

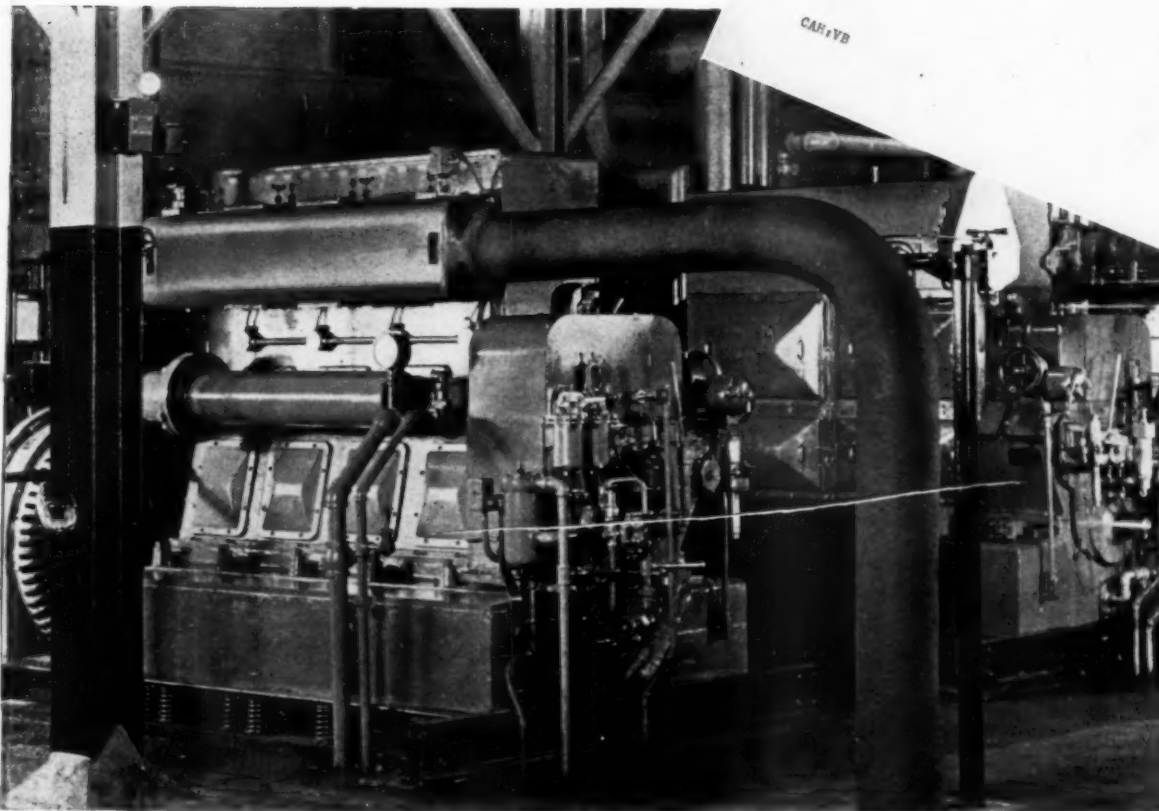
We know you will be gratified to learn of the 100% satisfactory performance derived from your Spring Mountings, installed under our two sets of National Superior 9 x 12, four cylinder, four cycle, 600 R.P.M. Diesel Generators with exciter and water pump. We regret very much that your Mountings were unknown to us at the time of making our original installation of the Power Plant as we would have eliminated the time and expense involved, installing the elaborate Isolation Cork foundation that proved entirely ineffective. Excessive vibration was transmitted throughout the plant and surrounding neighborhood to a very serious degree while the units operated on the heavy concrete foundations, isolated completely with cork on the bottom and sides.

It was indeed fortunate for us that you were able to design the Spring Mountings to maintain the same position of the units that eliminated any necessity of changing the piping, other than installing a flexible connection on the exhaust lines.

We were somewhat in doubt at first whether your Spring Mounting would detract from the desired good appearance of the installation, but we can frankly say, your design and construction has not impaired the appearance in the least and above all, you have given us a job which is absolutely perfect in vibration absorption.

You can be assured we will gladly discuss or show our installation to anyone interested in these Mountings.

Very truly yours,
RED RIVER REFINING COMPANY
C. A. Harris
Refinery Superintendent



A pair of 9' x 12' Superior Diesels, four cycle, four cylinder, 600 rpm. now successfully operating on Hussman Spring Mountings in the plant of the Red River Refining Co. at Burnham, Ill.

Send full details of your noise or vibration abatement problems to us and we will promptly submit an individual and comprehensive recommendation.

CARL HUSSMAN

Specialist in solving vibration problems

120 SOUTH LA SALLE ST., CHICAGO, ILL.

PROOF THAT RING-FREE
reduces cost
per K.W. hour
BY REDUCING FRICTION



... IN BUSCH SULZERS

**MACMILLAN
 RING-FREE
 MOTOR OIL**

1. GREATER FILM STRENGTH
2. HIGHER HEAT RESISTANCE
3. LONGER CLING TO METAL
4. FASTER PENETRATION
5. REMOVES HARD CARBON
6. IS NOT CORROSIVE



Nothing need be added to the above letter except to explain *why* RING-FREE reduces friction so much more than other oils: RING-FREE has greater film strength, higher heat resistance, longer cling and greater penetration. That's *why* it lubricates better; that's *why* it reduces wear and repair bills . . . in every type of diesel, gasoline or natural gas motor. But here's *more* good news . . . it removes hard carbon formed by fuel or other oils! There's a Macmillan Man near you . . . let him show you comparative tests between RING-FREE and any other oil you name.

MACMILLAN PETROLEUM CORPORATION

50 W. 50th St., New York • 624 S. Michigan Ave., Chicago • 530 W. 6th St., Los Angeles

CITY OF WINDOM
 OFFICE OF CITY CLERK

WINDOM, MINNESOTA
 Jan. 20th, 1938

I. Miller & Co.
 Sioux City, Ia.

Gentlemen:

You will be interested to know of our experience with Macmillan Ring-Free Oil in our light plant engines here in Windom, Minn.

We have here two Busch-Sulzer 375 hp. four cycle Diesel engines which were newly purchased about a year ago. We had been using a very popular nationally known diesel oil and had experienced difficulty keeping the temperature of the oil in the engines down to where we could maintain the pressure on our oil gauges.

We called on the factory representative of Busch-Sulzer and after every effort on his part to correct the trouble had failed, he advised us to install extra plumbing to turn the extremely cold city water into the coils in the oil cooler. This held our pressure up most of the time.

On Nov. 15th we purchased ten bbls. of Ring-Free oil from you and put it in one of the engines. The pressure ran entirely too high and we had to cut off the cold water in the coils of the oil cooler and the temperature of the oil still holds the pressure up.

This has proven to us that your oil has reduced the friction in this engine. Also our exhaust temperatures have dropped 40 degrees.

Over this period of 60 days our k.w. per gallon of fuel oil has increased an average of eight per cent. The engine also is running noticeably much smoother.

We consider this the finest lubricating oil we have ever used.

Respectfully,

J. J. Hiebert

Sup. Municipal Light Plant.

USE ONE OR SEVERAL

..the Savings the Same!

GM Diesel Power keeps Diesel-Electric Drive economies constant—whether you use big single units or a series of small engines.

NOW, you can satisfy your power requirements as best suits your type of vessel—with a few high-powered Diesel-electric units or a greater number of low-powered ones.

With the GM Diesel, either arrangement gives you equal economy.

For the basis of efficiency in this new-type Diesel engine is the cylinder. Thus it makes no difference whether you use a single unit of twelve cylinders, for instance, or three units of four cylinders each. The power output and mechanical efficiency of your power plant are the same.


Each cylinder operates independently—even to the point of having its own unit fuel-pump and injector. And to make it as efficient as possible, it is designed on the GM 2-cycle principle, which not only reduces bulk and weight but permits the use of a

new low-pressure blower to provide more thorough Uniflow scavenging.

Here is the Diesel engine that makes the Diesel-electric drive more adaptable than ever to the individual requirements and machinery arrangements of heavy marine craft. It enables practically all operators of vessels up to 9,000 deadweight tons to obtain Diesel-electric fuel economies even where Diesel installations have been unsuitable up to now.

And yet the story of the GM Diesel goes further than that. For General Motors does more than merely manufacture and install this new kind of Diesel Power. It assures you, in addition, of a minimum of idle time by maintaining responsibility for the continued servicing of every GM Diesel it sells.

Can General Motors and the GM Diesel be of any help to you? More than likely you'll find the right GM Diesel for your application right there in the oval below.



FOR ALL MARINE USES—GM DIESELS

- ☆ Towboat units ☆ Self-propelled barges
- ☆ Inland waterways tankers ☆ Main ship propulsion, in multiple units ☆ Auxiliary power plants

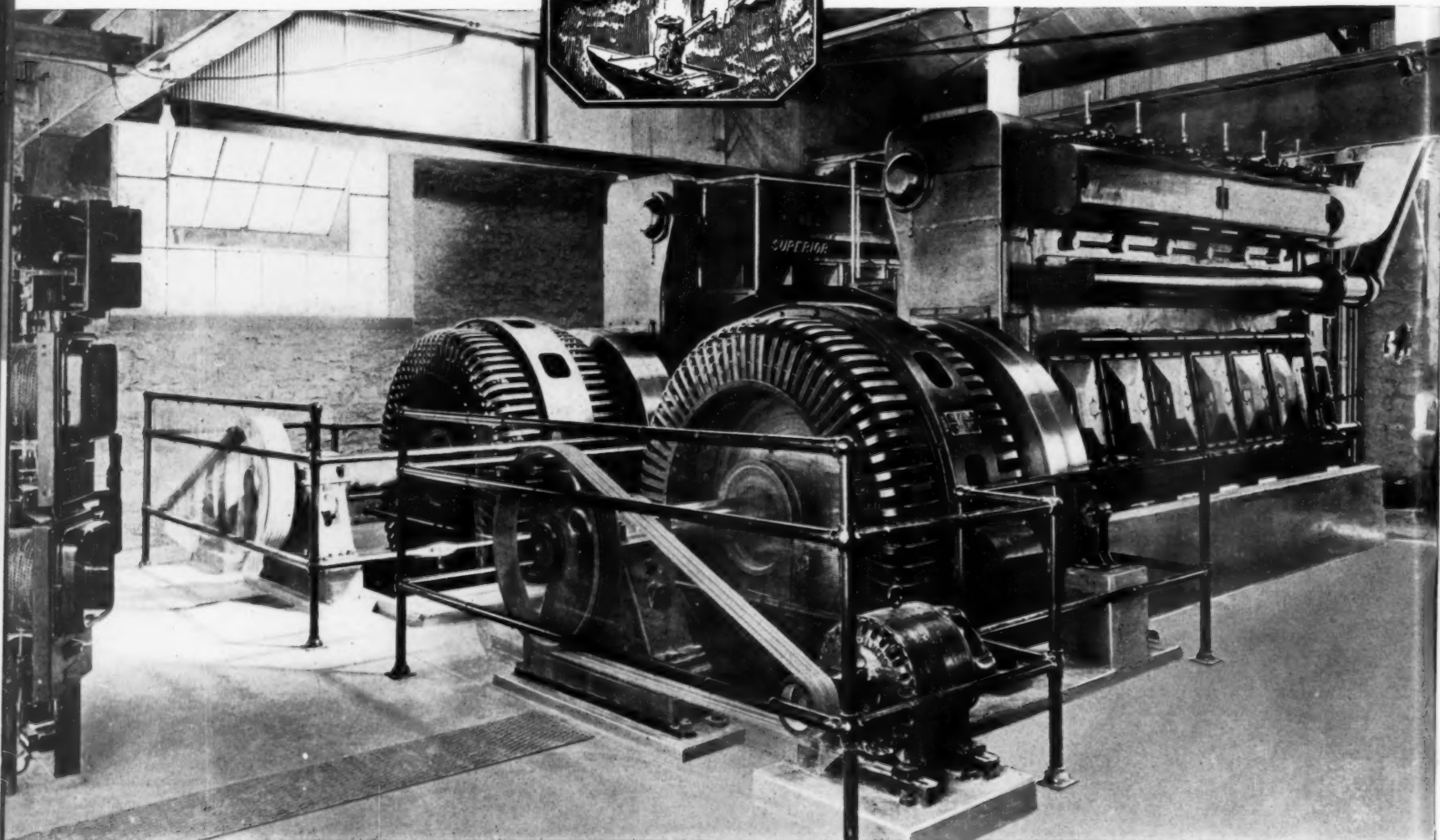


FORMERLY WINTON

GENERAL MOTORS

SALES CORPORATION

DIESEL ENGINE DIVISION • Cleveland, Ohio



Superior Diesels manufactured by National Supply Company, Springfield, Ohio, for the Columbia Quarry Company, Krause, Illinois. Engines equipped with American Bearings.

"BUGS" ARE BARRED

Before an engine earns its final stamp of approval from the men responsible for its design and construction, it is put through its paces to "get the bugs out." Indicated adjustments are made and everything put in A-1 shape. It is worthwhile noting that many makers of Diesels have standardized on American Bearings. These makers have learned by experience that there are no "bugs" in American Bearings. American Bearing metal's adaptability to Diesel use, plus American Bearing Corporation's manufacturing methods, insure top notch bearing performance not only in the shop tests, but also in day-by-day use on the job. American Bearings have the strength to stand heavy pressures; have the toughness to resist extraordinary deformation; have a low frictional co-efficient; have a relatively high softening and melting point; A B C bonding methods insure a lasting grip on the shell. In short, American Bearings have what it takes to give satisfaction.

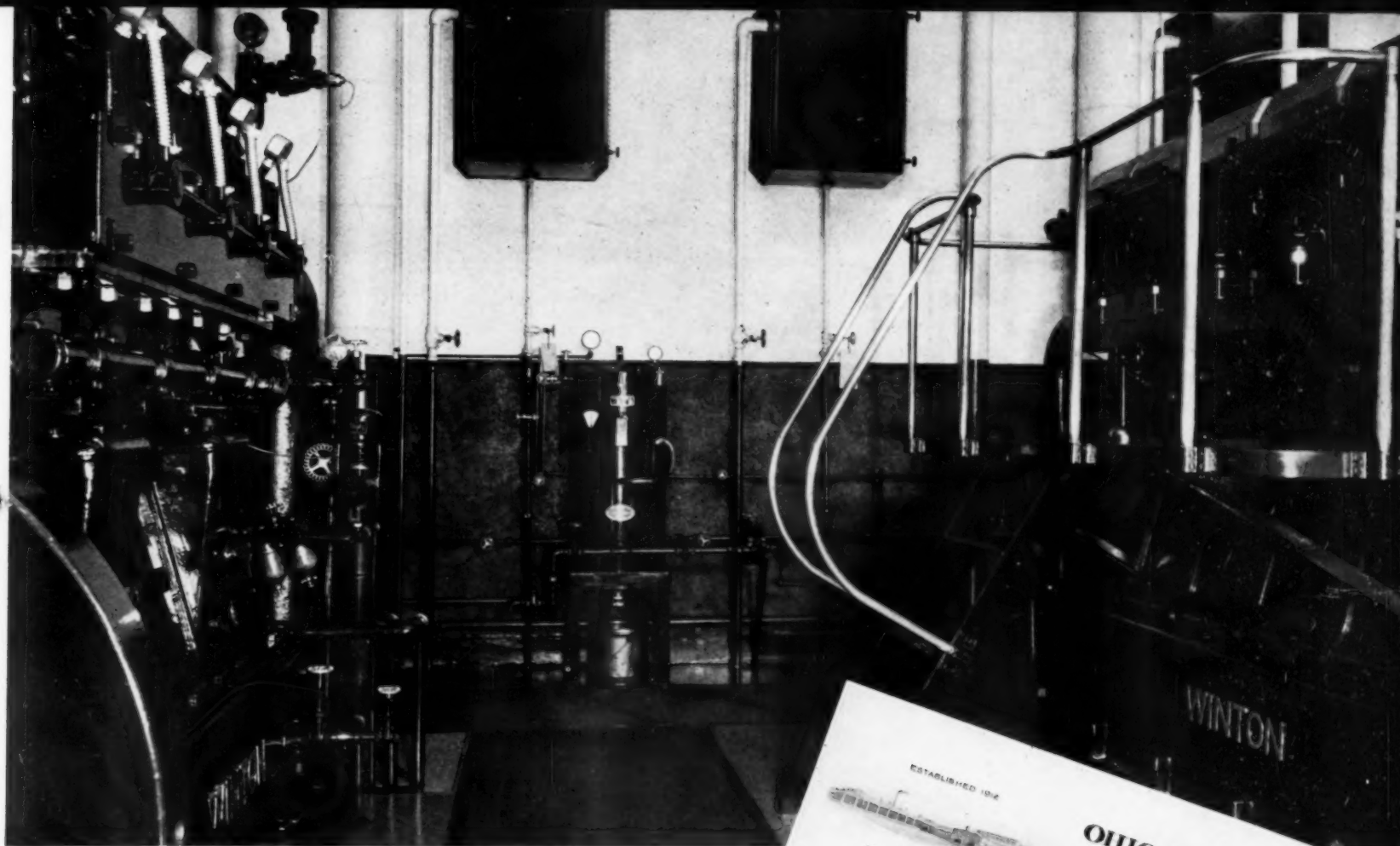
AMERICAN BEARING CORPORATION

AFFILIATED WITH NATIONAL LEAD COMPANY

INDIANAPOLIS



INDIANA



SKINNER SUPER FILTER

YOU have purchased high-grade Diesel equipment to furnish your power requirements. The results given in the attached letter are typical of users of Skinner Super Filters positive control of Diesel lubricating conditions. Think of the importance of such results in uninterrupted service and in cost of operation!

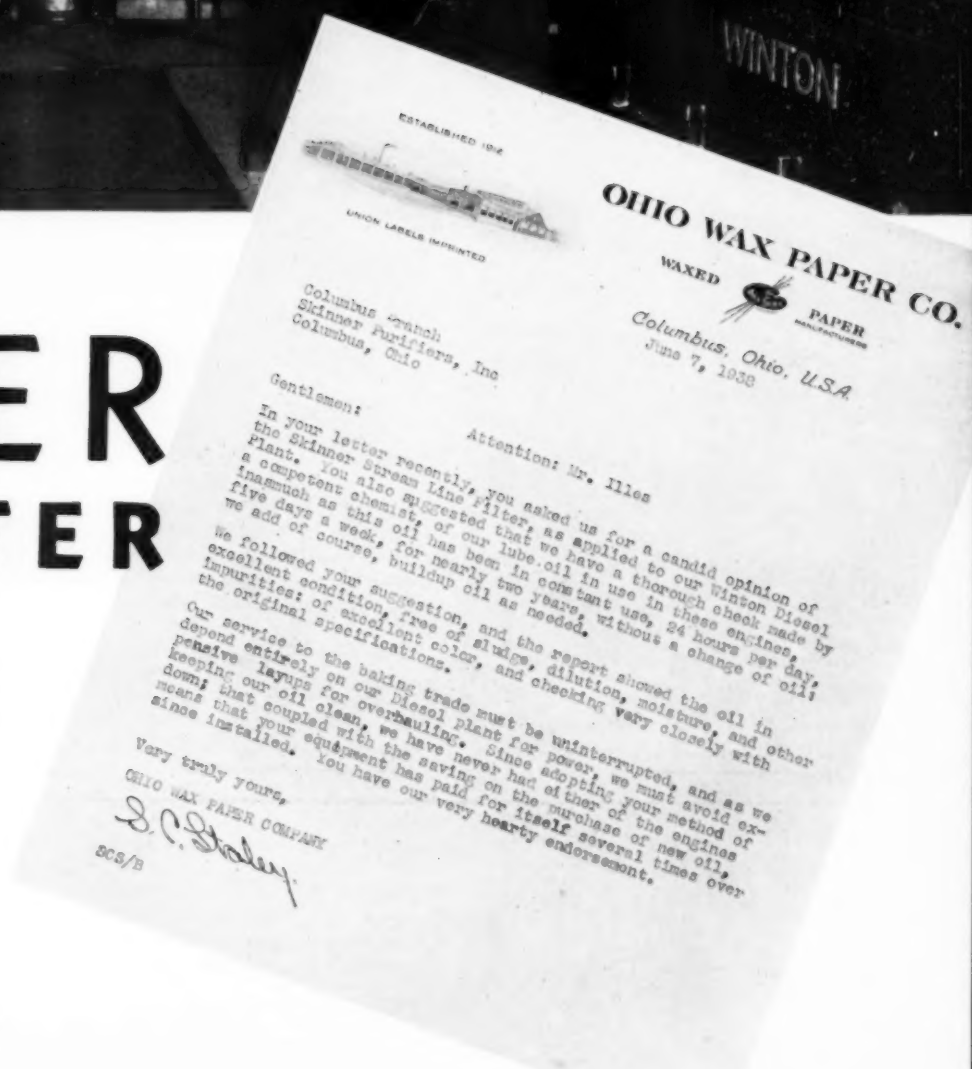
The filtering operation is fully automatic and extremely simple, accomplished by the finest mechanical filtration known. The cleaning of the Purifier only requires a reversal of air pressure through the unit. Units of the proper size are available to take care of any size or type of Diesel installation.

This outstanding service rendered by Skinner Purifiers is but typical of what can be accomplished for you, and we will gladly furnish details upon receipt of information concerning your Diesel installation.

SKINNER PURIFIERS Inc.

2231 DALZELLE STREET

DETROIT, MICHIGAN





Western Dredging Co., Selects— Atlas Diesels for Economical Power



Top, view of bow of dredge showing bucket line.

Bottom, revolving screen which separates coarse gravel from the fine.

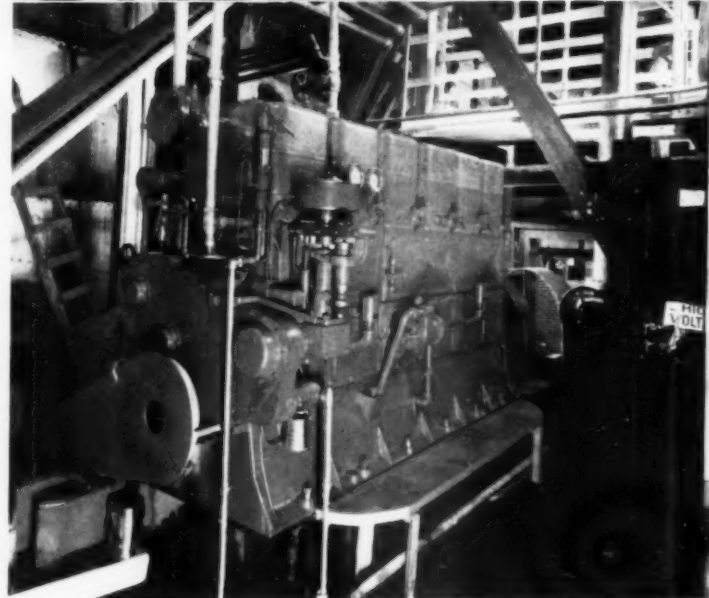
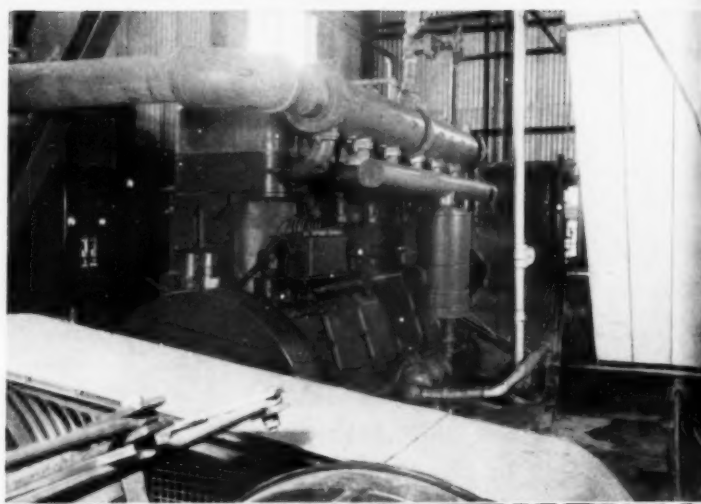
THE 6 cu. ft., bucket type gold dredge of the Western Dredging Co., operating on its property at John Day, Grant County, Oregon, is equipped with two 6-cylinder, 9" x 10 1/2" Atlas Imperial Stationary Diesel engines, each developing 200 hp. at 514 rpm.

Designed and constructed by the Walter W. Johnson Co. of San Francisco, the dredge was placed in service on November 14, 1937. Up to May 1st it had handled a total of 890,149 cubic yards of gravel, averaging 225 yards per hour.

All equipment of the dredge is operated by power provided by the two Atlas Diesel engines. One engine drives the main water pumps and a 75 KW generator which supplies power for the stacker, screen, lights and small motors about the dredge. The other Atlas engine furnishes power direct for the bucket line and winch.

Atlas Diesel engines have proved they are profitable equipment in dredging operations all over the world. Wrestling gold from alluvial deposits, making tortuous channels safe for water traffic, building dikes and revetments to harness rampaging streams—they're all alike when Atlas Diesels power the job. Sturdily built Atlas Diesel engines go on day after day, delivering continuous, dependable economical power in a wide range of speeds to answer every need that may arise while the job is in progress.

Atlas Imperial Stationary Diesel engines are available in sizes from 30 to 525 hp. The services of our Engineering Department are at your command to help you in the application of Atlas Diesel power in the solution of your problem.



Top, exhaust side of 200 H.P. Atlas Diesel with second engine in the background.

Bottom, operating side showing close regulating type governor.

ATLAS IMPERIAL DIESEL ENGINE COMPANY

Eastern Division
115 BROAD STREET, NEW YORK, N. Y.

Central Division
228 NO. LASALLE ST., CHICAGO, ILLINOIS

Western Division
1000 NINETEENTH AVENUE, OAKLAND, CALIFORNIA

Gloucester — Baltimore — Charleston — Miami — Jacksonville — Tarpon Springs — New Orleans — Fort Worth
Houston — El Paso — Terminal Island — Seattle — Portland — Vancouver — Ketchikan — Honolulu — Manila

ATLAS IMPERIAL

A Typical Example
of the Fine Workmanship
on EVERY G-E
Generator



He Finishes the Bore to a Tolerance **ONE SIXTH the THICKNESS of this paper**

WILSON Gould finishes the bore and keyway of a G-E generator to a tolerance one sixth the thickness of this sheet of paper. His care in working to precise measurement is typical of the skilled craftsmanship that goes into G-E generators.

He and his fellow workmen take pride in this fine workmanship—pride that is reflected in the efficient performance records of some 40 million kw of G-E generators in service. By scraping the generator

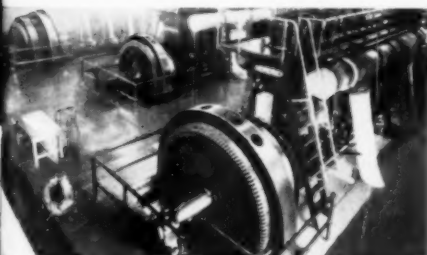
bore to such a close tolerance, Gould assures accurate press fit of the generator on the shaft.

Remember Wilson Gould and his careful craftsmanship when you specify a generator. Pride in such craftsmanship on the part of the men who build your generator is one of your assurances that it will give you high efficiency and require little maintenance. General Electric, Schenectady, N. Y.

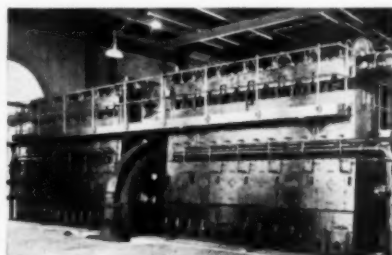
WILSON H. GOULD

An old-timer in the building of G-E generators, Wilson Gould began work with General Electric in 1888. Except for a few years in business for himself, he has been in generator production ever since. His work on generators has helped provide light and power for millions of people.

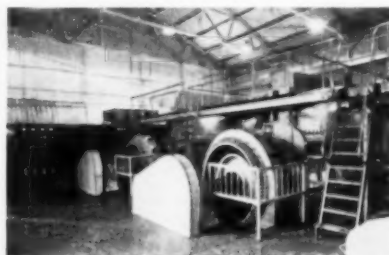
With baseball his favorite hobby, the Yanks his favorite team, Wilson Gould was relieved when Joe DiMaggio, leading homerun hitter in 1937, signed his '38 contract with the Yanks. Not just a major league enthusiast, Gould is an ardent rooter on the sandlot diamond near his home.



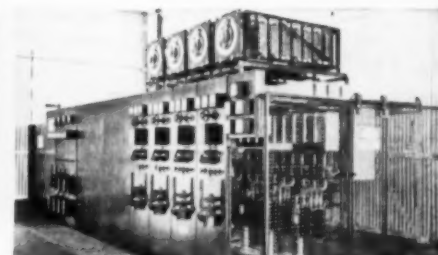
Three of four G-E generators installed in a municipal power station. Their efficiency led to the recent installation of the fourth.



One of several G-E generators in a Texas cement plant. The one shown here is of 1633 kva at 225 rpm.



Two of four G-E generators, of 625 kva each at 327 rpm, in the power station of a refinery. The switchboard in the background is also General Electric.



A close-up of the switchboard at the left. From General Electric you can obtain switchgear, voltage regulators, and cable, as well as generators, for your plant.

GENERAL ELECTRIC

040-55

This McDonald Experience Proves INTERNATIONAL Efficiency



ABOVE: This gives an idea of the soft ground over which the six International TD-40 Diesel TracTracTors travel most of the time on this job. Two of the units are shown here working with a scraper and a bulldozer. AT RIGHT: Another Model TD-40 TracTracTor and scraper moving between 55 and 60 cubic yards an hour.



• Six International TD-40 Diesel TracTracTors are doing a large share of the excavating for the William P. McDonald Construction Company of Flushing, N. Y., on $4\frac{1}{2}$ miles of new highway near the eastern end of Long Island. Four of these Internationals are operating $4\frac{1}{2}$ -yard, 4-wheel scrapers on this job. The other two, one equipped with a bulldozer and the other with a bullgrader, are on grading work.

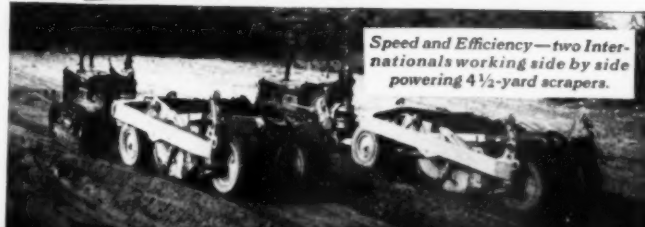
It was originally planned to let tractors and scrapers open up the work and then turn over the main excavation to other equipment. In a thorough five-day test, however, two International TD-40 Diesel TracTracTors proved so efficient on scraper work that the other four were purchased and the major part of the dirt moving given to them.

The facts and figures gathered by this nationally known construction company prove the value of International Diesel TracTracTors on the job. Our nearby International industrial power dealer or Company-owned branch can give you additional information on this model, and on other crawler and wheel tractors, and power units in the International line.

INTERNATIONAL HARVESTER COMPANY
(INCORPORATED)
180 North Michigan Avenue Chicago, Illinois

Five-Day Test on Internationals Your Guide to Efficient Power

- ★ One International Diesel TracTracTor moved 1,951 $\frac{1}{2}$ cubic yards in 34.75 hours, averaging 56.2 yards per hour on an average haul of 524 feet. Average load was 4.11 yards and an average of 13.65 trips were made an hour.
- ★ The second unit, identical with the first, moved 2,061 $\frac{1}{2}$ cubic yards in 34.25 hours, averaging 60.3 yards per hour on an average haul of 514 feet. Average load was 4.25 yards and an average of 14.15 trips were made an hour.
- ★ Their flexibility and travel speeds on scraper work, their correct balance and absence of unnecessary weight, the remarkable performance of the Diesel engine, and a minimum of "time-out" for maintenance won this job for TracTracTors.

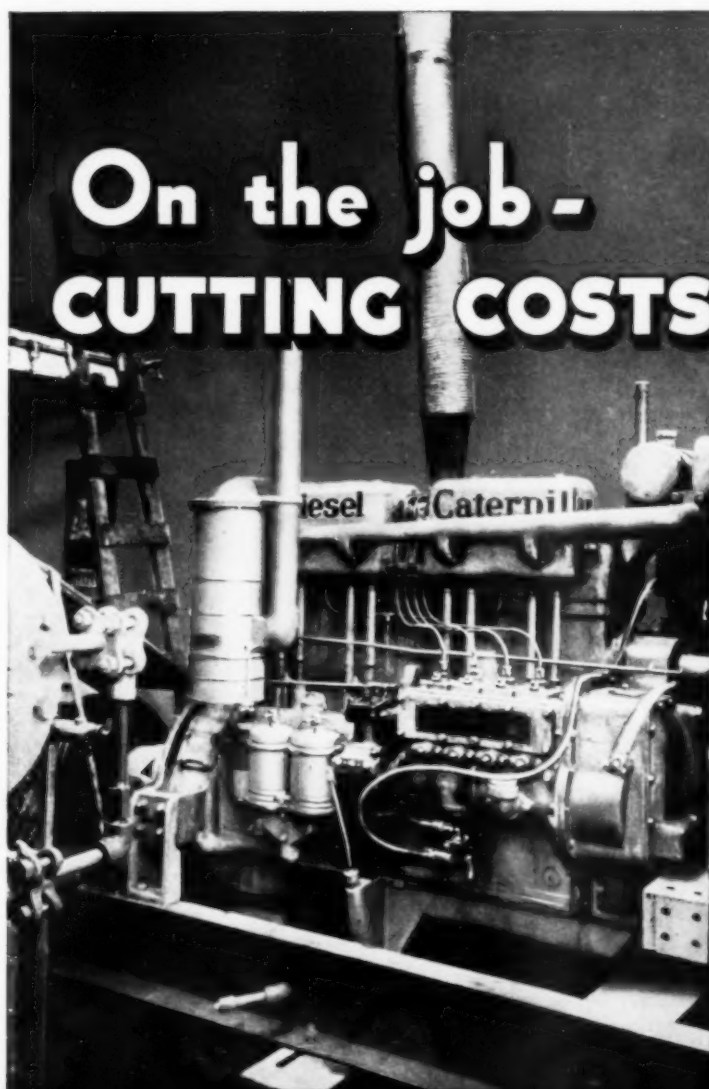


INTERNATIONAL Industrial Power

On the job - CUTTING COSTS

RPM
DIESEL ENGINE
LUBRICATING OIL

Approved by
CATERPILLAR
TRACTOR CO.



"Cuts costs!"—No wonder more "RPM" Diesel Engine Lubricating Oil is being sold and used in "Caterpillar" Diesel Engines than all other Diesel oils combined!

E. L. Kramer, A. J. Kreckler & Co., Chicago, Illinois, reports: "In October 1935 we purchased a D-7700 'Caterpillar' Diesel Engine for power to operate our compressor used in connection with our refrigeration machinery. . . . Since then we have been using 'RPM' Diesel Engine Lubricating Oil and the results have been extremely satisfactory. We . . . compliment you on your successful development of a lubricant for this type of engine."

A. J. KRECKER & CO. (Signed) E. L. Kramer

"RPM" Diesel Engine Lubricating Oil is distributed by the following companies under the brand names indicated:

IN THE UNITED STATES

"RPM" Diesel Engine Lubricating Oil:
THE CALIFORNIA COMPANY (Montana only)
THE CARTER OIL COMPANY, Tulsa, Oklahoma
HUMBLE OIL & REFINING COMPANY
STANDARD OIL COMPANY (Indiana)
STANDARD OIL COMPANY (Inc. in Kentucky)
STANDARD OIL COMPANY (Nebraska)
STANDARD OIL COMPANY OF CALIFORNIA
STANDARD OIL COMPANY OF TEXAS
UTAH OIL REFINING COMPANY

Diol "RPM" Diesel Engine Lubricating Oil:
COLONIAL BEACON OIL COMPANY, INC.
STANDARD OIL COMPANY OF LOUISIANA
STANDARD OIL COMPANY OF NEW JERSEY
STANDARD OIL CO. OF PENNSYLVANIA

Signal "RPM" Diesel Engine Lubricating Oil:
SIGNAL OIL COMPANY

Sohio "RPM" Diesel Engine Lubricating Oil:
THE STANDARD OIL COMPANY (Ohio)

IN CANADA

"RPM" Diesel Engine Lubricating Oil:
IMPERIAL OIL LIMITED
STANDARD OIL COMPANY OF BRITISH
COLUMBIA LIMITED

THROUGHOUT THE WORLD

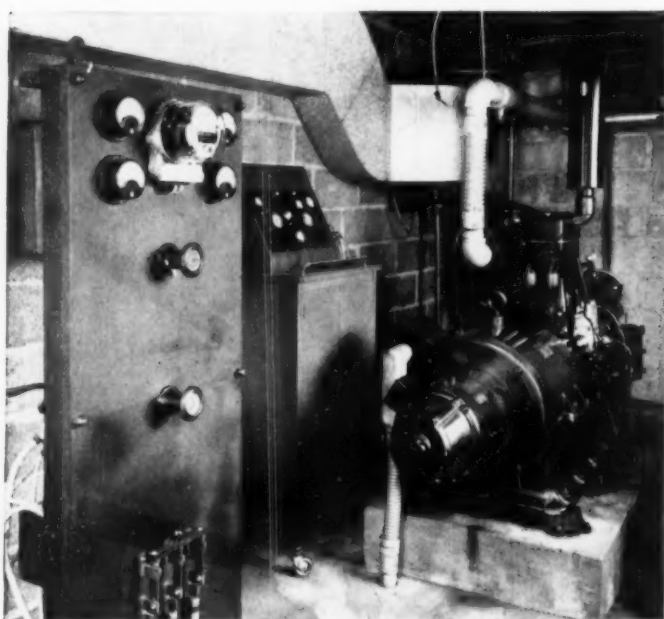
"RPM" Diesel Engine Lubricating Oil is also available through distributors in more than 100 other countries.

STANDARD OIL COMPANY OF CALIFORNIA

A *Superior* SERVICE STATION



Combined Gasoline Service Station and Lunch Room operated by Joseph H. Rinehart at Fort Lee, N. J.



The Model GA-2, two cylinder, 25 H. P. Superior Diesel Electric Power Unit is installed in a very complete and neatly arranged separate engine room adjacent to the Lunch Room.

The air duct which is shown against the upper left wall conveys hot air from a unit heater through which the engine cooling water passes thus saving a large percentage of the normal heating cost.

Located at George Washington Bridge Plaza, in one of the biggest traffic centers in the country, this thoroughly modern service station has been operating on Superior Diesel Power since August 1936.

Among independent Diesel power plants of every size and type Superior Diesels have demonstrated an operating economy that has been unsurpassed.

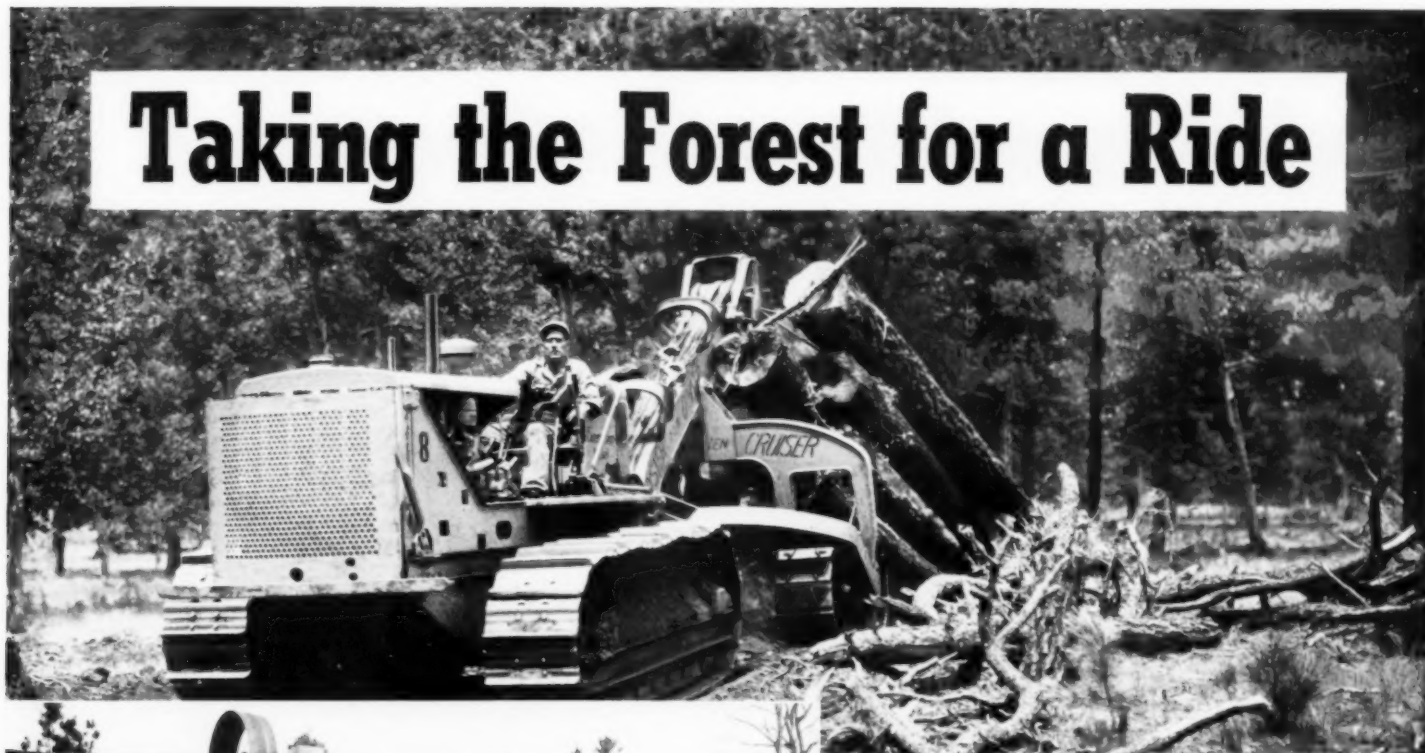
Moderate in cost, easy to install and faithful in service these units which range from 10 to over 500 K.W. have earned their way to an enviable position in the field of Industrial Diesel applications.



THE NATIONAL SUPPLY COMPANY . . . SUPERIOR ENGINE DIVISION

FACTORIES: Springfield, Ohio; Philadelphia, Pa. • SALES OFFICES: Springfield, Ohio; Philadelphia, Pa.; New York, N. Y.; Los Angeles, Calif.; Houston, Texas.

Taking the Forest for a Ride

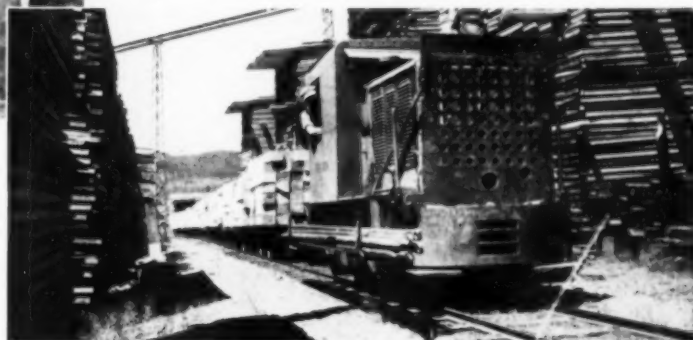


LOGGING—A D7 "Caterpillar" track-type Tractor and Hyster logging cruiser in Arizona. . . . One of a fleet of seven operating under the supervision of the U. S. Forest Service in Apache National Park. Owner, Southwest Lumber Mills.



SAWMILL—A 60-horsepower "Caterpillar" Diesel Engine operating a sawmill in Georgia. Capacity, 15,000 bd. ft. per 10-hour day. Fuel consumption, about 2½ gals. of 8c fuel per hour—or 13½¢ per thousand feet. Owners, Hill Bros., Dorchester, Ga.

YARD LOCOMOTIVE—A 60-horsepower "Caterpillar" Diesel Engine drives this 7-ton "Vulcan" locomotive in the yard of the McCloud River Lumber Co., Calif. Handles twice the load at less than half the fuel cost of former gasoline locomotive. (Consumes only 45½¢ worth of Diesel fuel per 8-hour day.)



The lumber industry offers vivid examples of the wide variety of jobs "Caterpillar" Diesel power can handle. In "Caterpillar" Diesel track-type Tractors, it winch-skids huge logs out of the thicket . . . ground-skids or arch-hauls them in bunches to floating pond or loading point . . . hauls heavily loaded trailer-trains to sawmill or railroad.

In "Caterpillar" Diesel Engines, it converts logs into lumber by driving saws, planers—in fact, complete mills. In "Caterpillar" Diesel-powered locomotives it hauls lumber to, from and about the storage yards.

"Versatility" is indeed "Caterpillar" Diesel power's middle name! It can, and does, perform many tasks in many industries—at a cost that is matchlessly low and with a dependability that

is amazingly sure. Low up-keep, easy maintenance and adjustment, and long life—all of prime importance—are further advantages which make "Caterpillar" Diesel the power of today.

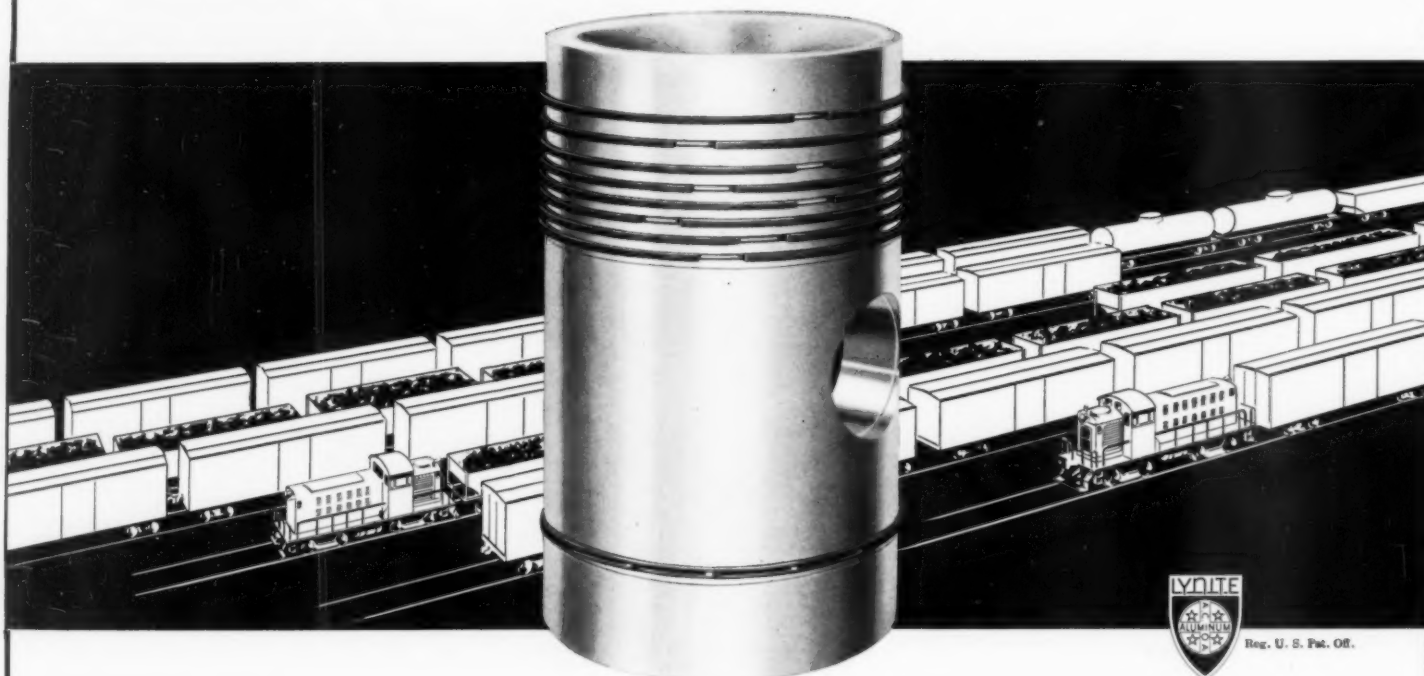
Leading machinery and equipment manufacturers power their products with "Caterpillar" Diesel Engines

CATERPILLAR TRACTOR CO., PEORIA, ILL.

CATERPILLAR DIESEL POWER

DIESEL ENGINES • TRACK-TYPE TRACTORS • ROAD MACHINERY

A *Story* OF LYNITE PISTONS AND THE CHANGED SPECIFICATIONS



IT HAPPENED some years ago, and was this railroad's first experience with Diesel engines. They were not familiar, therefore, with the enviable record already established by Lynite pistons on Diesel engines.

Specifications for a Diesel-powered switching locomotive were submitted to a railroad. Not being familiar with Lynite pistons, the railroad objected to the proposed use of these pistons in this engine. Notwithstanding, five locomotives so equipped were purchased.

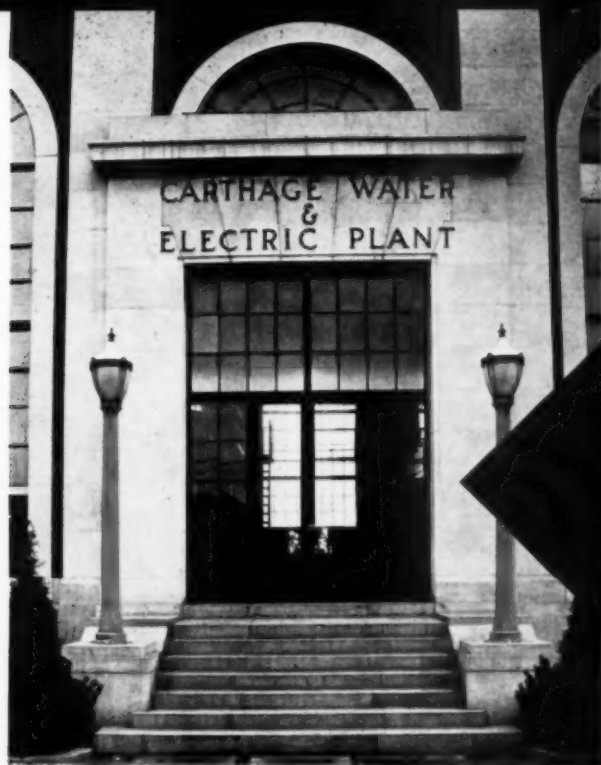
Eighteen months later, the railroad prepared specifications for additional switching locomotives.

This time, Aluminum pistons, because of satisfactory service record, were *definitely specified*. Ten new locomotives were purchased, their engines equipped with Lynite pistons.

The properties of Lynite pistons accounting for the better performance are these: Their lighter weight reduces bearing pressures; bearings last longer. Superior heat-conducting property of Lynite pistons distributes heat more uniformly throughout their mass. This combination of properties assures thousands of hours of trouble-free service. Aluminum Company of America, 2141 Gulf Building, Pittsburgh, Pennsylvania.

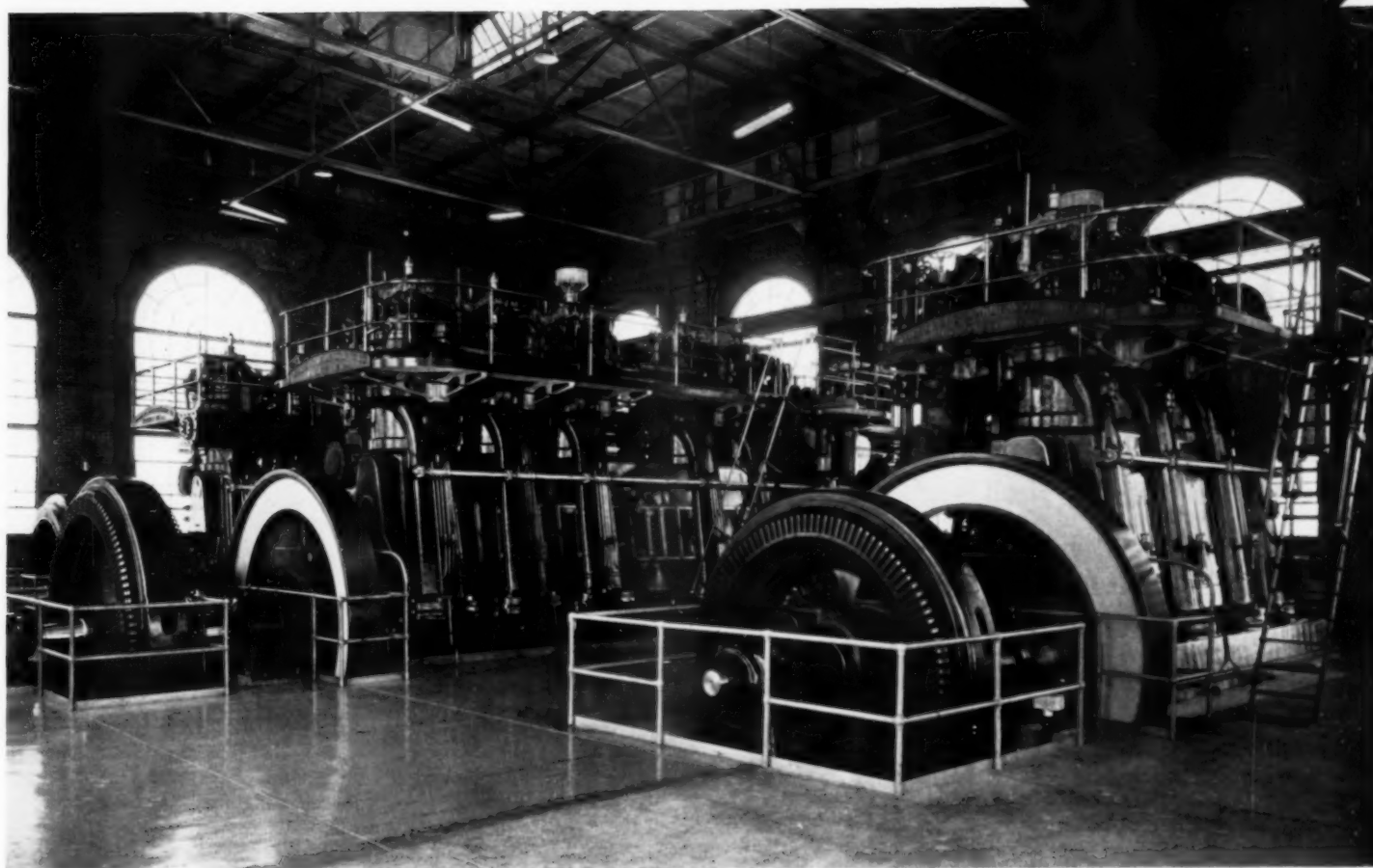
LYNITE PISTONS

C A S T O F A L C O A A L U M I N U M



ERIE

All the Nordberg Diesel engines installed in the Carthage, Mo. Municipal Diesel Plant are equipped with Erie Crankshafts. The first 750 hp. Nordberg installed in 1921 right up to the latest 2250 hp. Nordberg purchased last year all depend on Erie crankshafts. See leading article in this issue.

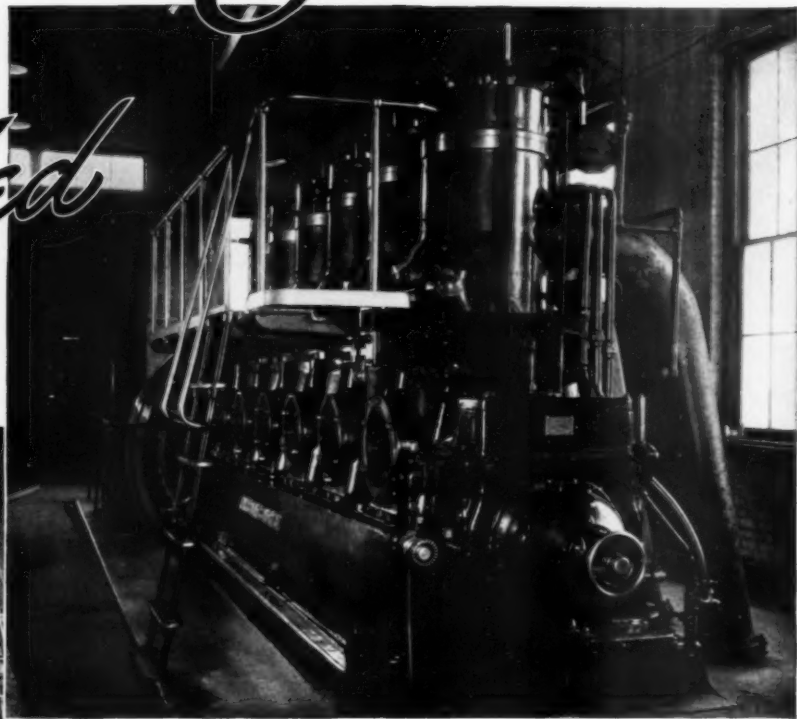
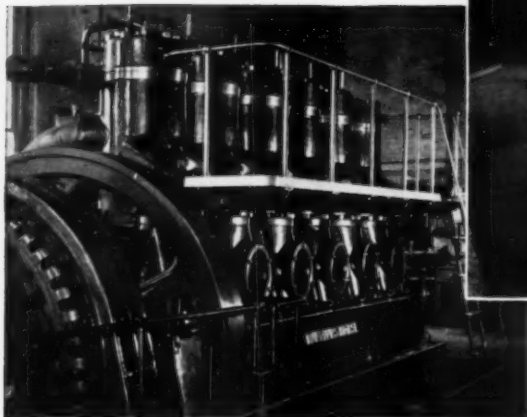


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REX W. WADMAN
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FRONT COVER ILLUSTRATION — Mr. H. E. Manville's Yacht *Hi-Esmaro*, powered with two 1,500 hp. Cooper-Bessemer Diesel engines. The auxiliary plant consists of two 150 hp. Cooper-Bessemer Diesels.

TABLE OF CONTENTS ILLUSTRATION — Auto Patrol, Caterpillar Diesel, clearing roads near Gore Pass, Colorado. Temperature 45° below zero, altitude 9,000 ft. above sea level.

DIESEL PROGRESS for July, 1938, Vol. V, No. 6. Published monthly by Diesel Engines, Inc., 2 West 45th St., New York, N. Y. Tel. MUrray Hill 2-5092. Subscription rates: U. S. A. and Possessions \$3.00 per year; 25c per copy. All other countries, \$5.00 per year; 50c per copy.

B. J. VON BONGART
Technical Editor

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CARTHAGE, MISSOURI

By B. J. VON BONGART

CARTHAGE, Missouri, is a town of about 11,000 inhabitants and is the seat of Jasper county. It is situated on the western slope of the Ozark Mountains, 150 miles south of Kansas City and about 250 miles southwest of St. Louis. Its municipally owned and operated Diesel-electric and water plant is not a recent venture, but dates back to the closing years of the last century.

Little did a few public spirited citizens of Carthage realize, forty years ago, that the municipal

power plant which they started would some day gain nation-wide recognition.

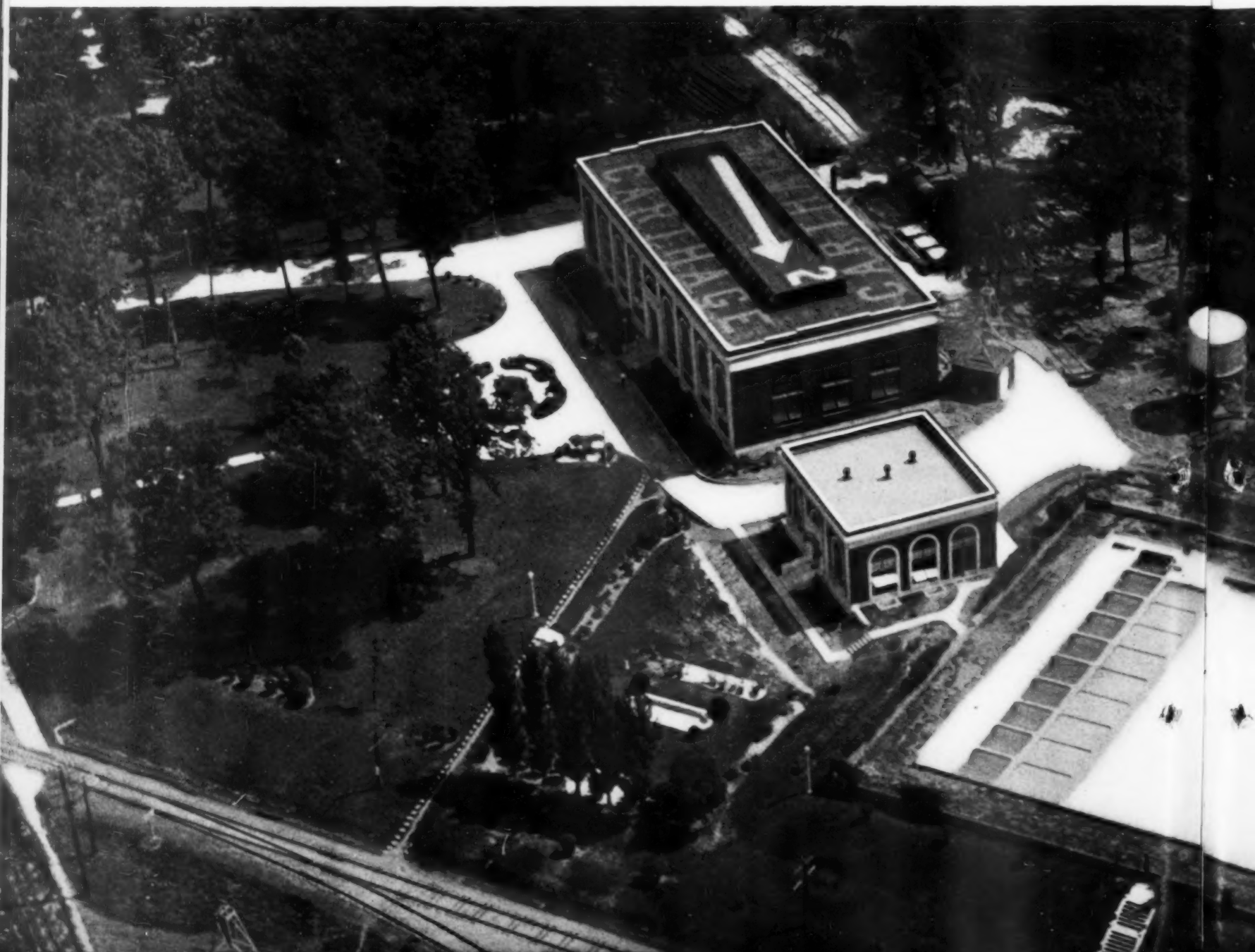
In 1898, a steam operated plant was placed in service, representing an initial investment of \$25,000.00; however, it was not a success but a liability, operating during 1920 at a loss of \$57.37 rather than revenue.

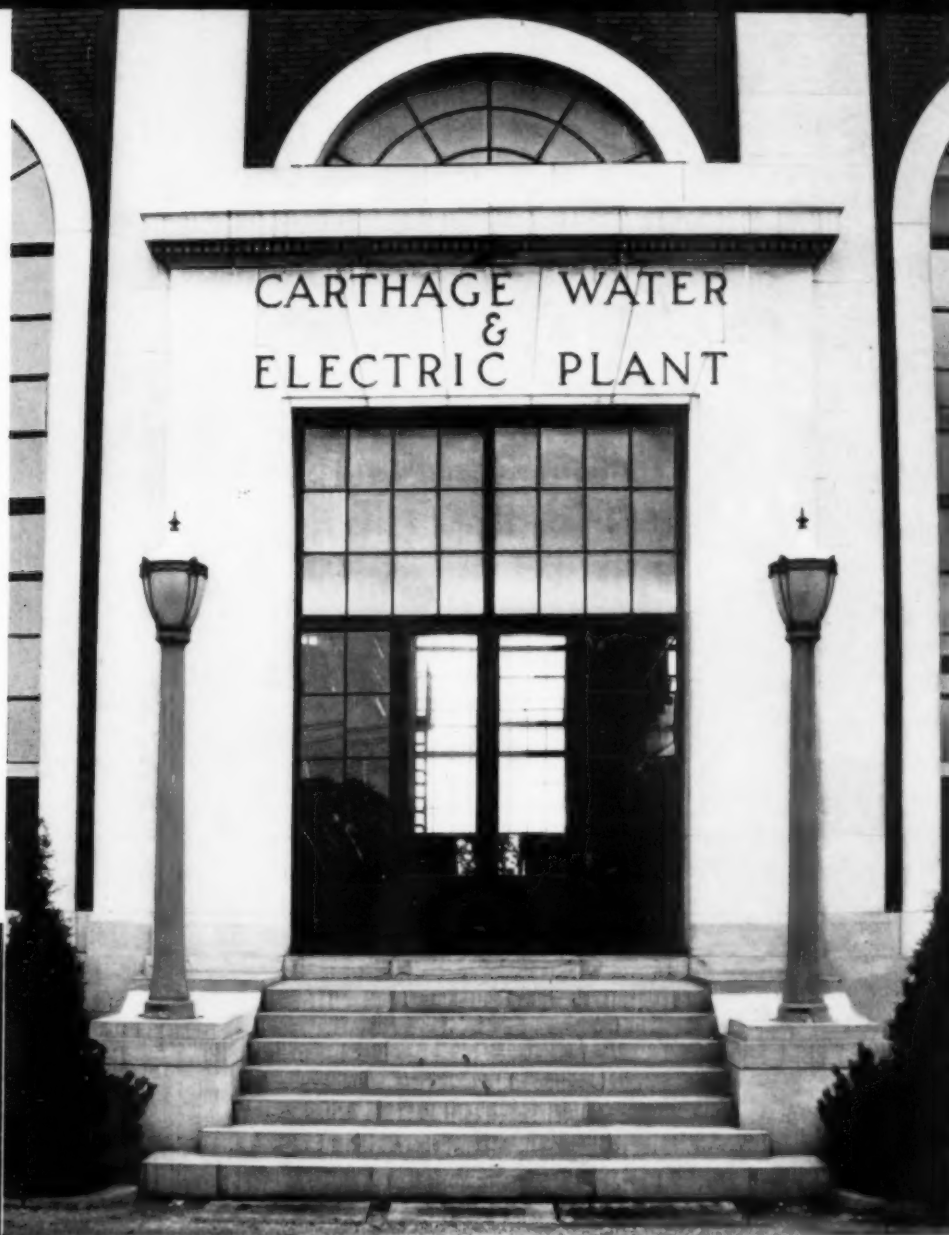
At this time, a 750 hp. Nordberg Diesel engine was installed, producing during the first year of its operation (1921) a NET PROFIT of

\$48,375.85! What a story these figures represent. While a loss of some fifty-odd dollars per year is a bagatelle, a net profit of over \$48,000 per year indicates a financial success worth being proud of.

In 1924, another Nordberg Diesel engine of 1,250 hp. was added, and with these two Diesels in service, the old steam plant was eliminated, thereby decreasing operating costs and increasing the net profits still further.

Fig. 1—This aerial view shows the power and water plants, water storage reservoir and fuel tanks; also walks and driveways about the grounds.





By 1927, the demand for electricity had increased to a point where additional generating capacity was needed. Since the plant building was inadequate and could not readily be enlarged, it was decided to erect a new building with space for at least four Diesel engines.

A wooded tract of $4\frac{1}{2}$ acres was selected and the new plant erected thereon amidst a sylvan setting of spacious lawns, trees and shrubbery, an ideal layout for an ideal plant. When the building was completed in 1928, another 1,250 hp. Nordberg Diesel was purchased and installed therein together with the 1,250 hp. and the 750 hp. Nordbergs which were removed from the now obsolete old plant. Carthage's power and water plant is shown in Fig. 1.

It is a magnificent structure of steel construction, the walls being of dark red brick trimmed with locally quarried marble. Carthage marble being well appreciated in the middle west.

The building has an inside length of 150 feet

and a width of 65 feet. Its height from the floor to the underside of the roof trusses is 27 feet, and a basement of 12 foot headroom extends under the entire building. Beauty of architecture, correct layout of equipment and the care that is given both inside and out, make this building one which any city could be proud to own.

The demand for electricity increased to such an extent, that a fourth unit had to be installed in 1936. Again, a Nordberg was chosen, but one of 2,250 hp. directly connected to a 1,875 Kv-a Allis-Chalmers generator. The power plant layout is shown in Fig. 3, total power output 5,500 hp. But, Carthage is growing, more power was needed and another Nordberg Diesel has recently been purchased. This is another 2,250 hp. unit and will be installed in place of the 16-year-old 750 hp. engine, which, while still serviceable, was too small to be of any practical use to the city. This unit is shown in Fig. 4. With two 1,250 hp. and two 2,250 hp. units, the plant will have a total of 7,000 hp., all of them Nordberg Diesels.

The waste heat from the engines is not wasted in Carthage but used for heating and other purposes, to wit: The cast iron muffler of one of the 1,250 hp. engines is enclosed in a metal jacket. Air drawn from the basement is circulated through the jacket and then discharged into the building. The muffler of the 2,250 hp. engine is fitted with a coil of steel tubing giving 80 square feet of heating surface. Hot water taken off the line between the high head pumps and the heat exchangers, circulates through this coil. This hot water is used to heat the power house during inclement weather, for the water softening plant, warehouse, fuel tanks and other purposes in and about the plant.

Fuel is delivered to the Carthage plant by tank car. Delivery is made on a track directly back of the power plant, and the fuel-oil is pumped into two 10,000 barrel storage tanks. The fuel flows by gravity to the centrifuges located in the basement of the power plant, and is then pumped to the two 15,000 gallon tanks located in the yard. From these tanks, the oil flows to the transfer pumps in the basement, and is delivered to the daily supply tanks on an overhead gallery adjacent to the engines. With storage capacity of 20,000 barrels, it is possible to purchase oil in quantity and at times when the market is most favorable, thereby effecting a considerable saving in the cost of fuel. The storage tanks are provided with coils for heating the fuel in cold weather.

The careful thought that has been given to the

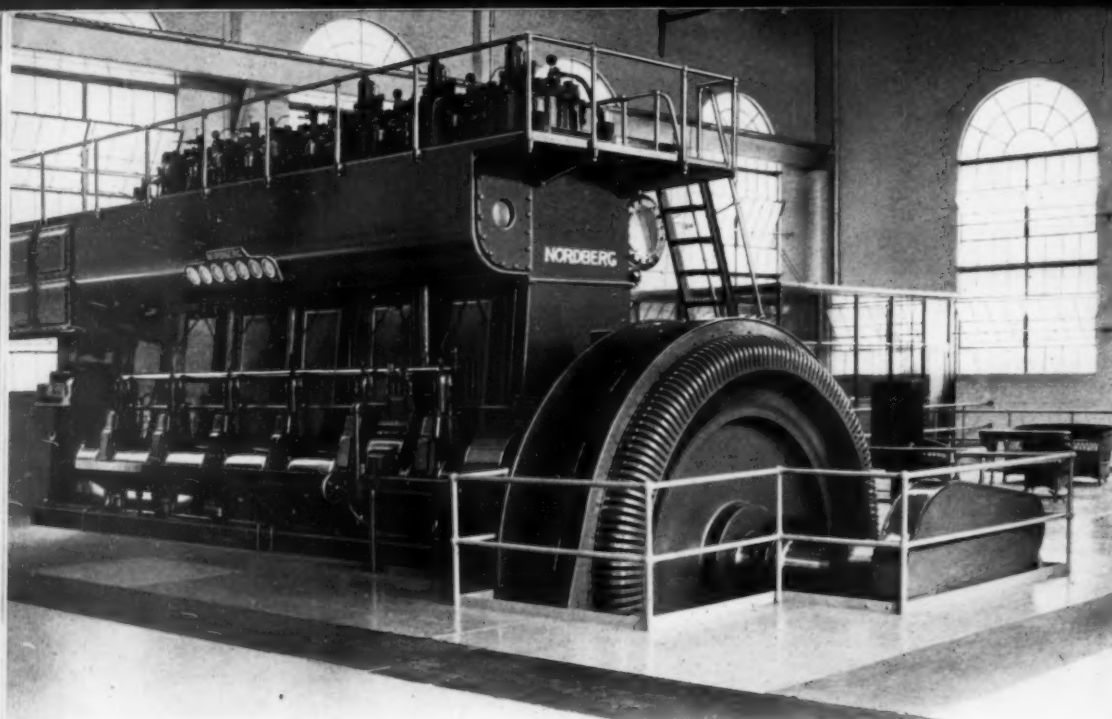


Fig. 4 — Operating side of the new 2,250 hp. Nordberg unit.

various details of the plant, is also reflected in the systems of lubrication provided for the four engines. Particular thought has been given to provide an adequate and dependable supply of clean lubricating oil, so arranged to be economical in the use of oil and requiring but a minimum of attention.

Tanks and filters are equipped with heating coils and electric immersion type heaters. Centrifuges are connected to continuously clean a certain amount of the lubricating oil, and the piping and valves are so arranged that the centrifuges may draw from any tank or filter. The overhead storage tanks are provided with

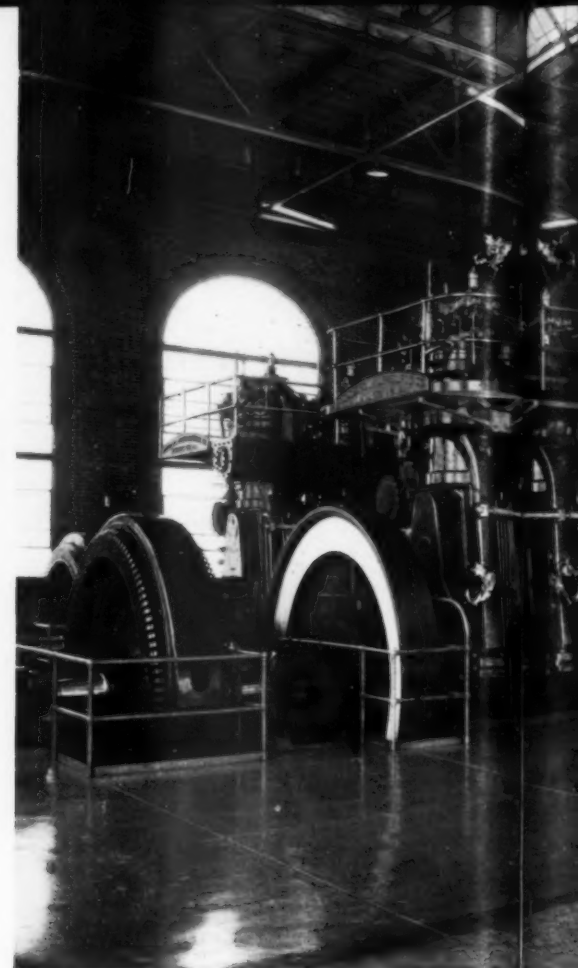


Fig. 3 — The original 750 and the two 1,250 hp. Nordberg Diesel engines. Another 2,250 hp. unit is soon to occupy the same space as the 750 hp. engine shown here.

TABLE 1. 12-YEAR OPERATING RECORD

Year	KW Hours Produced	Production Cost including Depreciation	Distribution and General Expense	Total Operating Expense	Cost per KWH at Switch-board	Total Cost per KWH	Revenue for Current Sold	Net Profit from Operation
1926	3,733,420	\$48,176.48	\$29,663.74	\$77,840.22	.0129	.0208	\$90,462.36	\$12,622.14
1927	4,146,327	48,087.00	30,734.70	78,821.70	.0116	.0190	96,993.28	18,171.58
1928	5,019,310	51,891.57	30,207.61	82,099.18	.0103	.0164	108,472.46	26,373.28
1929	5,696,870	53,881.22	34,311.33	88,192.55	.0095	.0155	127,410.17	39,217.62
1930	5,986,230	50,992.88	43,726.19	94,719.07	.0085	.0158	129,109.63	34,390.56
1931*	3,030,840	24,781.41	20,924.44	45,705.85	.0082	.0151	69,910.10	24,204.25
1932	6,261,500	60,136.62	32,519.35	92,655.97	.0096	.0148	133,021.69	40,365.72
1933	6,556,200	57,255.13	33,634.04	90,889.17	.0087	.0139	127,254.86	36,365.69
1934	6,686,200	59,802.32	26,180.12	85,982.44	.0089	.0129	131,933.06	45,950.62
1935	6,973,200	66,919.88	29,626.80	96,546.68	.0096	.0138	129,630.77	33,084.09
1936	8,761,800	79,750.41	33,654.72	113,405.13	.0091	.0129	141,812.78	28,407.65
1937	10,926,600	83,946.52	37,594.48	121,541.00	.0076	.0111	165,902.85	44,382.85

*Covering a 6 months period only, because of change in fiscal year.

TABLE 2. ANALYZING PRODUCTION COSTS OVER A SIX-YEAR PERIOD

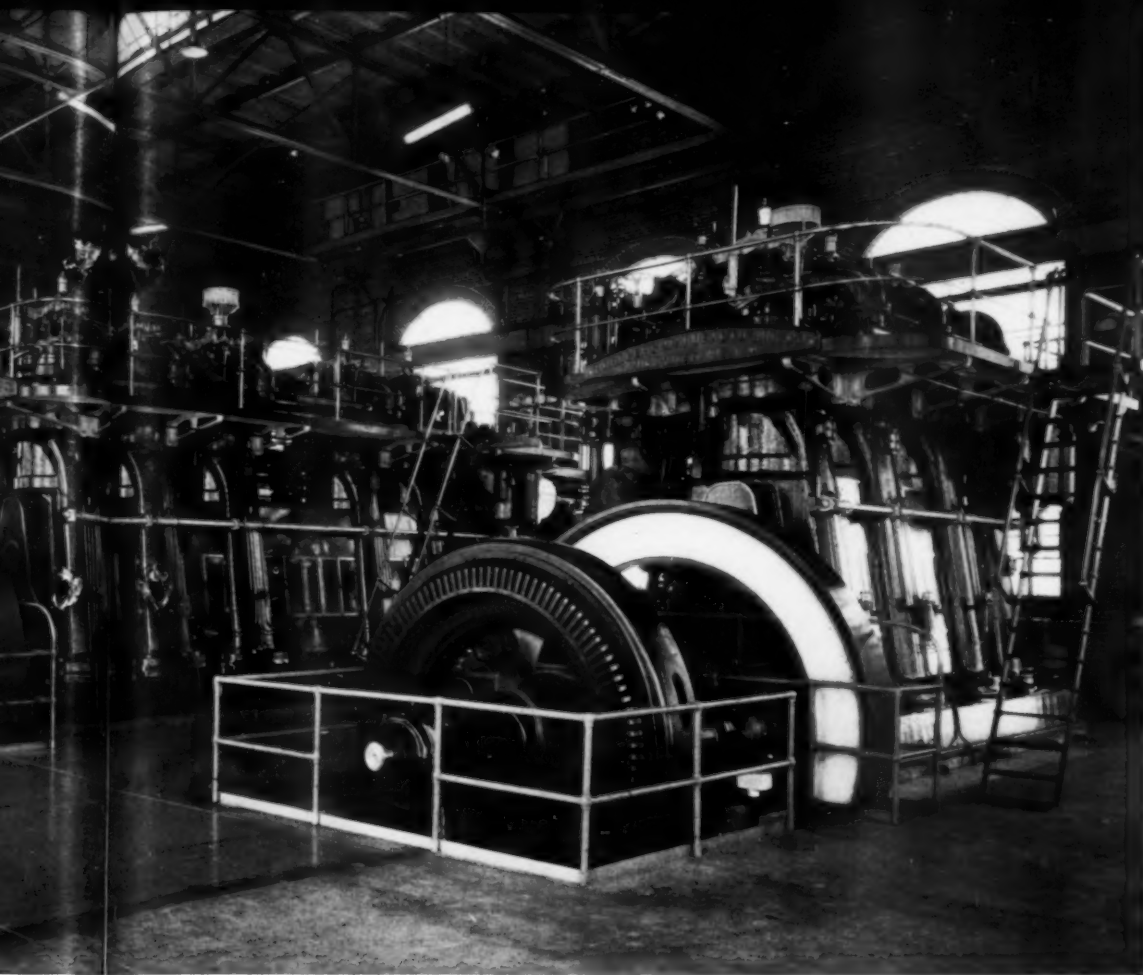
Year	KW Hrs. Produced	Fuel	Salaries and Wages	Supplies Lub. Oil etc.	Maintenance & Repairs		Water	Total Production Cost	Gals. Fuel Oil	KW Hrs. per Gal. of Fuel Oil
					Engines	Buildings, Auxiliaries, etc.				
1932	6,261,500	\$13,035.53	\$13,426.02	\$2,383.08	\$2,549.70	\$3,412.99	\$45.26	\$34,852.58	672,439	9.31
1933	6,556,200	13,571.51	12,603.08	1,609.91	3,213.00	1,056.35	19.45	32,073.30	695,806	9.42
1934	6,686,200	14,008.81	13,684.07	2,010.76	3,338.89	1,386.40	17.87	34,446.80	692,156	9.66
1935	6,973,200	18,396.57	14,146.34	1,943.80	5,480.03	1,423.29	23.02	41,413.05	713,108	9.78
1936	8,761,800	24,410.45	15,019.16	3,263.38	8,569.66	2,442.80	383.69	54,089.14	848,138	10.33
1937	10,926,600	28,883.79	16,028.11	2,057.49	5,070.99	2,317.89	10.10	54,386.37	887,188	12.31

visible and audible alarms, warning the operators in case of high or low levels of oil supply. A green light shows when a high level is reached and a red light in case of low level. An electric horn also sounds to warn the operator in case the lights are unnoticed.

COMPARATIVE COST OF OPERATION OF THE OLD AND NEW UNITS

With the new 2,250 hp. unit in service, it immediately became evident that the new engine was far more economical to operate than the older engines. In Table 1, the cost per kw. hour was reduced from \$.091 in 1936 to \$.0076 in 1937, a reduction of about 16 per cent. The yearly period refers to the fiscal year and since the engine was placed in operation during the second month, this figure no doubt would have been further reduced had the engine operated throughout the entire year.

In Table 2, for the fiscal years 1932 to 1936 inclusive, the kw. hours per gallon of fuel for the older engines ranged from 9.31 to 10.33, while for 1937 with the 2,250 hp. unit in service about 10 months of the year, this increased to 12.31 kw. hours per gallon. From Table 2, it will also be noted that from 1936 to 1937, the kw. hours increased from 8,761,800 to 10,926,600,



while the production cost remained constant at about \$54,000. The better economy of the 2,250 hp. engine made possible an increase of more than 2,000,000 kw. hours at no increase in cost. The value of free services given by a municipal plant is too often overlooked. If a plant is given credit for these services computed at normal rates, the profits would be greatly increased. On the other hand, if purchased from private companies, the tax payer would have to pay the bill.

According to the 1937 audit report, the City of Carthage received free services from its municipal plant amounting to \$32,365.67. This includes water and electricity furnished municipal institutions, hospitals, parks, police and fire departments, etc. Over 700 street lamps are installed, which make Carthage an extremely well lighted city without expense to the tax payers. Water is furnished without charge for the sewerage plant and the flushing of streets. Every possible aid, financial and otherwise, has been given to the Park Board in its construction projects. During the last five years, financial help in the amount of \$26,247.77 has been donated to the city by purchase of city revenue bonds.

NEW WATER SOFTENING PLANT

The policy at Carthage has always been to improve its utilities and give better service to the

community. An example of this is the new water softening plant built in 1934. Carthage has always had an abundant supply of pure, sparkling, crystal clear water but, coming from deep wells, contained considerable hardness.

A new water softening building was placed between the power plant and the existing storage reservoir. It, too, is built of dark red brick with Carthage marble trim and is of the same architecture as the power plant. Both inside and out, this new water plant is in keeping with the high standards of design and construction for which the municipal improvements of Carthage are so well known.

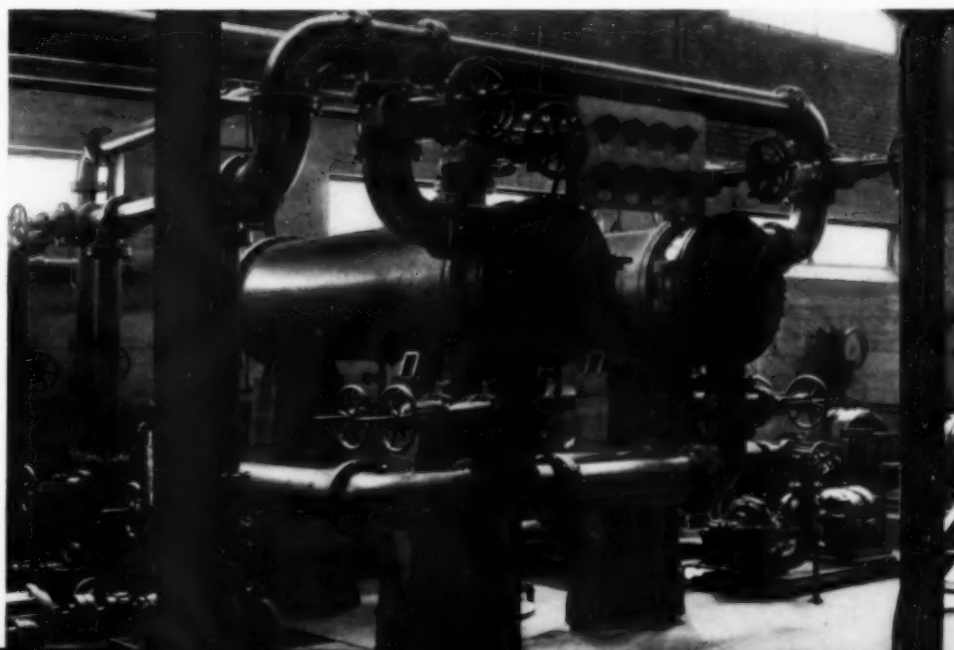
This water plant operates on the principle of

excess lime treatment. Changes were made in the old 1,500,000 gallon reservoir to adapt it to this system and two rapid type sand filters were provided, each having a capacity of 1,000,000 gallons per day. With this new plant in operation, the hardness has been reduced from 12 to $4\frac{1}{2}$ grains per gallon at no additional expense to the consumer, the rates remaining unchanged. It is estimated the saving in soap alone in the City of Carthage amounts to \$36,000 annually.

The success Carthage has attained with its utilities can largely be summed up in two words "Good Management." This is substantiated by the fact that from a total investment by the tax payers of \$345,000, the plant holdings today have a value of \$2,000,000. The tax payers' investment has been twice offset by depreciation charges. The value of free services alone rendered the city during the years the plant has been in operation can be conservatively estimated at \$750,000. All this has been accomplished notwithstanding numerous rate reductions from which the citizens of Carthage have benefited.

Carthage is fortunate in having had for many years the loyal cooperation between citizens and management. It has been free from political strife, the principal reason why many municipal plants have been unsuccessful. The water and electrical departments are controlled by a non-partisan Board of Public Works, consisting of four members. The plant is under direct management of a competent superintendent. Throughout the entire organization there is evidence of the high standards in engineering, personnel and equipment which have been set up and maintained throughout the years. The Carthage Municipal Plant is not only a successful financial venture, it is a valuable asset to the city in every way and is recognized as one of the outstanding Diesel-engined municipal power plants in the country.

Heat exchangers and duplicate high and low head circulating water pumps.



THE TUNA CLIPPER

"ST. MARY"

By A. W. PONSFORD

DEPARTURE of the steel, all-welded tuna clipper, *St. Mary*, late in May from San Diego on her maiden fishing voyage to Central American tuna banks, marked the addition of the second similarly constructed vessel to the Diesel-powered Southern California high-seas fleet, now numbering more than 100 unique hook-and-line ships.

Built at a cost of \$65,000 by the Shockey Boiler Works from the board of G. Bruce Newby, for Steve Massa & Co., *St. Mary* is a dream come true for H. K. Shockey, head of the concern which contracted to build the clipper on leased ground at San Diego.

Given a free hand by the owners, he incorporated into the hull itself, his own ideas of constructing this new type of clipper in a fleet, which, with the exception of the *Sun Harbor* he also delivered in 1937, and the 10-year-old, riveted *Santa Cruz*, had been composed entirely of wooden bottoms.

Compared with the wooden giants which are constantly joining the fleet, *St. Mary* is a small clipper. Length is 80 ft., beam 21 ft., and loaded depth 10 ft. However, because the hull

is five-sixteenths steel, and the double bottom carries most of the quota of 12,000 gallons of fuel oil, the capacity for carrying refrigerated tuna is amazing as contrasted to the same ability of an 80 ft. wooden clipper.

The builder of this all-welded vessel claims steel will eventually supplant Oregon pine as hull material, pointing to approximately even first costs, considerably lower maintenance and 25 per cent greater potential earning capacity.

Certainly the engine room of the *St. Mary* is evidence of the great saving in space by use of steel. "The neatest engine room in the entire fleet," was the unanimous opinion of all who inspected it prior to the clipper's sailing.

In a wooden clipper there is no room for such essentials as the ice machines, bait pumps, manifold, switchboard, etc. These are usually located on the main deck, immediately above the propulsion and auxiliary Diesels.

Yet, in the *St. Mary*, all this auxiliary equipment is neatly arranged below, and there is still "walking room" around the three engines.

The main engine is a 260-hp. six-cylinder, JM



type Superior four-cycle Diesel, maximum speed 600 rpm. During trial runs in San Diego harbor this Diesel drove the clipper at 10½ knots over the measured mile.

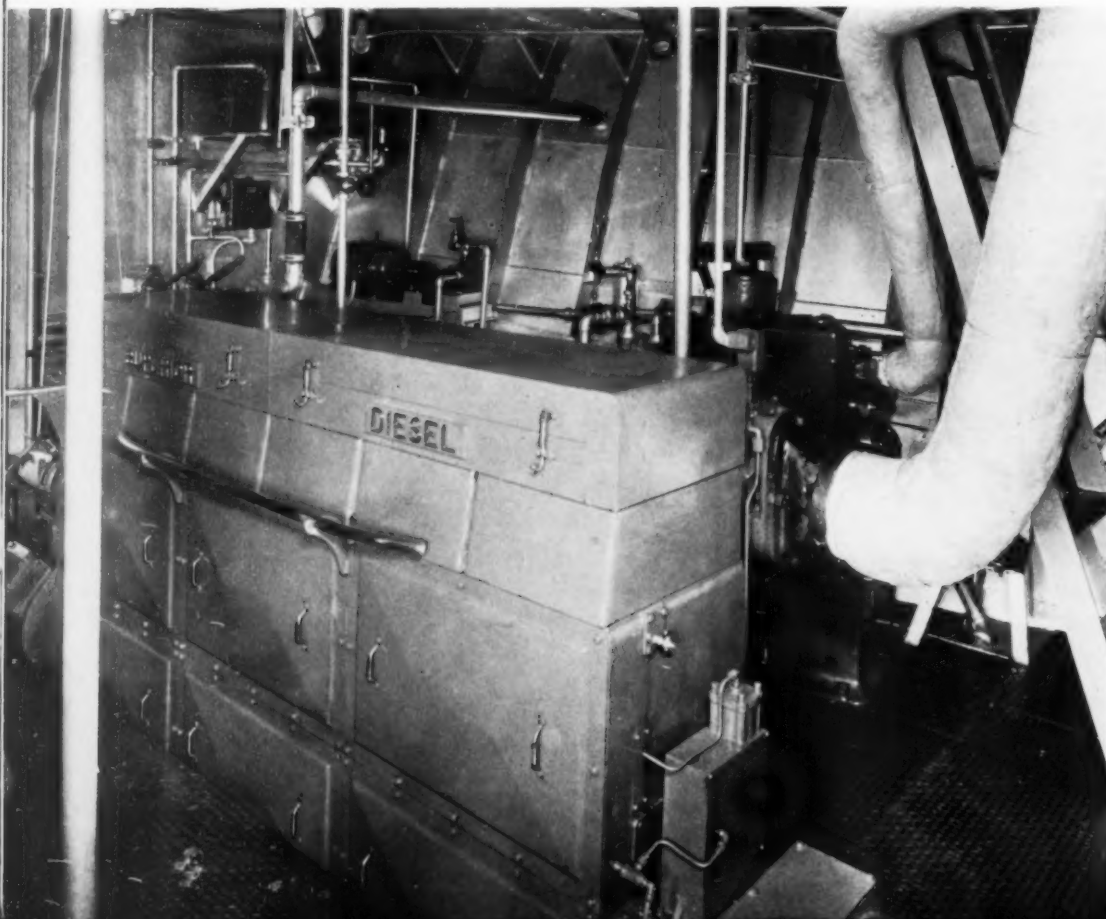
Assisting machinery, as in all modern tuna clippers, is in duplicate, pulsed by electricity. To supply power for 30-kw. generators, two Model "A" four-cylinder Superiors, rated at 62 hp. at 1,500 rpm., are used. It is not customary, however, to operate Diesels for auxiliary work in this class of vessel above 1,200 rpm.

Two most vital assisting units in this clipper are the bait pumping system and two-phase refrigeration plant. Without these, it would not be possible to operate.

For keeping alive some 150,000 live sardines to be used for bait, perhaps a couple of thousand miles from where these bait fish were seined in one of several "bait corrals" along the western shores of the Pacific, there are two 6-inch suction, 6-inch discharge, vertical type pumps, driven by 7½-hp. motors. All pumps, and all motors except those operating the ammonia compressor are Fairbanks-Morse.

The bait fish are stored and kept alive in two deck tanks and two wells. Afterward three of these four compartments are used as fish holds, but while in service as bait containers, the

The Superior Diesel main propulsion engine.





The 80 ft. all welded-steel Tuna Clipper "St. Mary."

pumps must deliver "solid" ocean water continuously, or the silversides die in a few minutes.

Working tuna banks in tropical waters, from Mexico to the Galapagos Islands on the equator, and dealing with a full-blooded fish that quickly spoils unless handled with great care, the refrigeration system is of vital importance to the *St. Mary*. Central unit is a 5 x 5 Kohlenberger Pacific ice machine, driven by a 15-hp. variable-speed Century motor.

The capacity of 126 tons of tuna is handled by two methods: Chilling by coils lining the main hold, and assisted by tons of crushed ice; and by sea-water cooling in the tanks.

The main hold is encircled with 2,500 ft. of 1 1/4 in. ammonia pipe, and divided into compartments by means of removable binboards. Here, each tuna is packed separately, uncleaned, in ice. The temperature maintained in here and in the coil-lined shaft alley, is approximately 29 degrees F. Sixty per cent of the capacity, or 80 tons is stored by this method.

The remainder, or 26 tons, goes into the 12-ton capacity wells and deck tank, all of which are lined with several hundred feet of ammonia coils. Sufficient sea water is chilled to immerse the fish within each compartment and temperatures of 27 degrees F. are strived for.

A departure from accepted custom in sea-water

cooling is noted in the *St. Mary*. Instead of using a shell and tube cooler as a central chilling agent for the ocean water and distributing it through a header to various compartments, water does not circulate within these wells.

Instead, the builder is relying upon the movement of the vessel to keep the water agitated and in constant contact with the frosted coils. It is a new development and will be watched.

Intruding heat from a blazing sun aboard deck and surrounding surface water reaching as high

as 90 degrees F., is guarded against by complete insulation of all compartments and the main hold, with 4 in. sheet cork.

When unloading the wells, the fish are spilled into the shaft alley, carried thence to the main hold hatch and elevated to the cannery pierhead.

Emergency manual pumping has been discarded on this clipper, by the simple expedient of cutting the bilge system into one of the 6 in. bait pumping lines. Fire protection is secured by three 50 lb. CO₂ tanks with remote control and lever-released from the main deck.

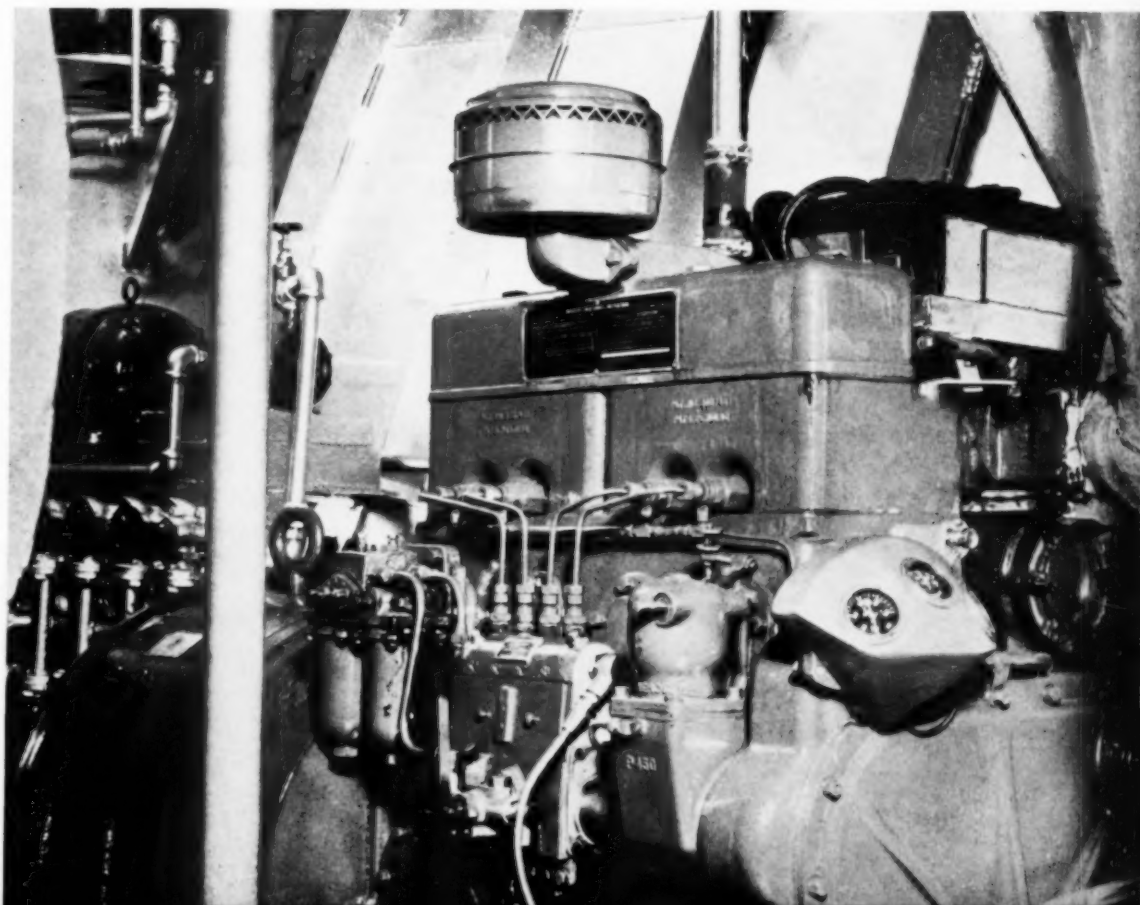
Fuel to give an estimated 5,000 miles cruising range is carried in four compartments of the double bottom, two wells and a third tank, all handled through the fuel pump manifold for trimming the ship. All these are separate watertight compartments.

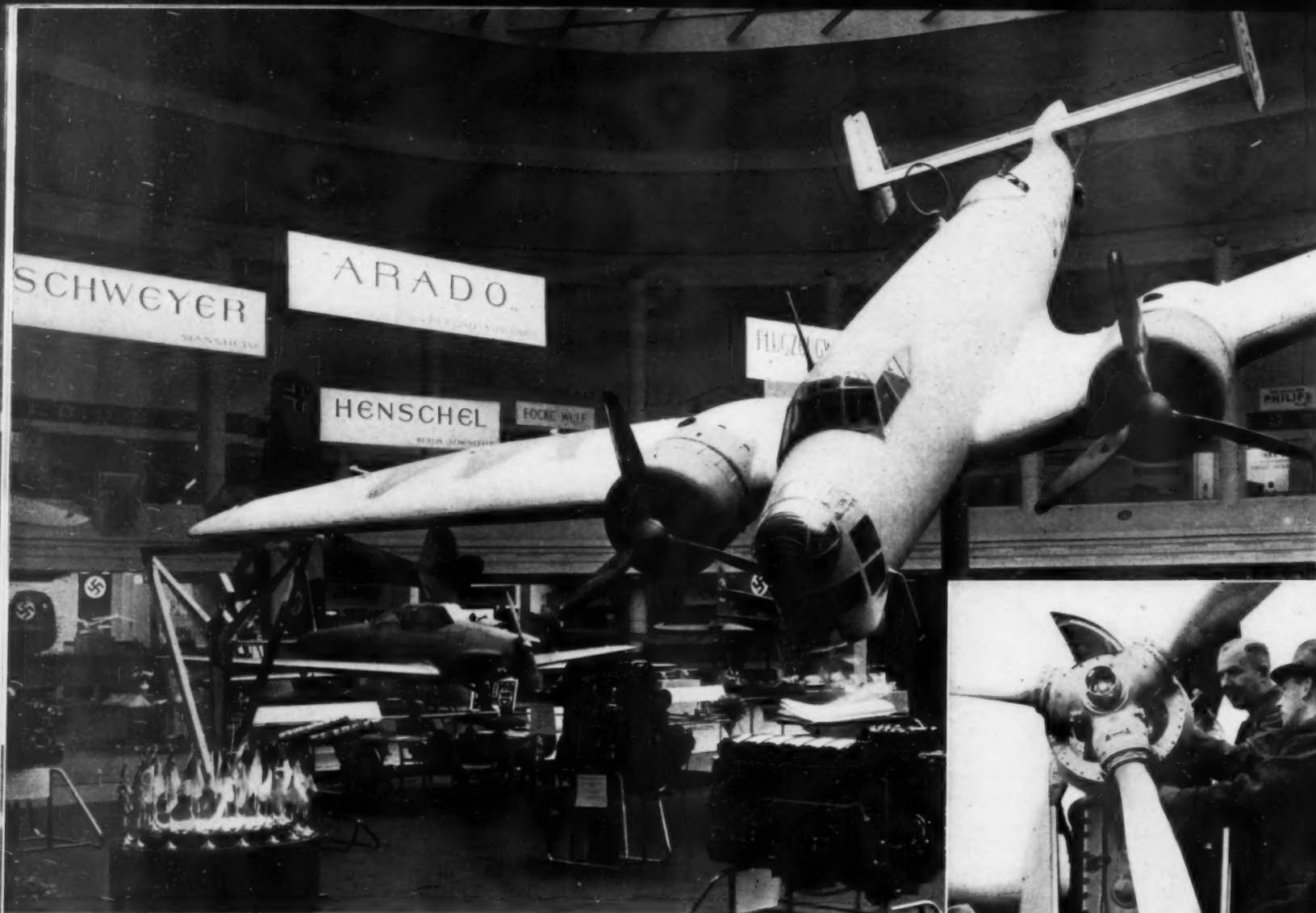
In preparing the exterior and interior of the hull and compartments for painting, all surfaces were sand blasted. The paint used, over a red primer, was a special corrosion resisting paint with a cement base. Anti-fouling paint was chosen for underwater exterior surfaces.

Accommodations for a crew of nine are placed on the main deck, with top side containing only the pilot house, chart-room and radio room. The wireless set is of world-wide range. State-rooms are equipped with built-in berths and spring mattresses.

The "Lamparo" net for seining live lures, is valued at \$2,500, and is carried in a net skiff operated by a powered net dory, these are slung amidships while the vessel is fishing.

The auxiliary Superior Diesel-electric installation.





Aircraft engines at the Milan Aero Show. In the center is a sectional Junkers "Jumo" 205 Diesel.

FIRE AND AVIATION

By PAUL H. WILKINSON

APPARENTLY the United States cannot make up its mind as to whether it wants helium-filled dirigibles or not. Several months ago the Navy Appropriations Bill included a 3,000,000 cubic-foot airship — much against the President's wishes. Later, when President Roosevelt changed his mind and recommended that \$500,000 should be appropriated toward the \$3,000,000 required for the airship, a House Appropriations sub-committee rejected his proposal. While the United States has plenty of helium for airships, it should be remembered that we do not have the Diesel engines to power them. In the past, we have had to buy our airship engines from Germany, and now that Diesels are required, we are worse off than before. The unfair treatment accorded Dr. Eckener by

Secretary Ickes in the helium transaction certainly has not improved the situation. Without Diesels in our airships it will be a waste of the public's money to build them.

Safety from fire hazard for lighter-than-air craft, as well as for heavier-than-air craft, is made possible by the Diesel. Strange as it may seem, the United States actually was the first country in the world to combine non-inflammable lifting gas and non-explosive engine fuel in the same airship. This was in 1931, when the Goodyear *Defender*, a 178,000 cubic-foot, helium-filled, non-rigid airship, was equipped with two 180 hp. Packard DR 980 air-cooled Diesels. Trial flights totaling 239 hours flying time were carried out during that winter to determine the



Making final adjustments to a "Jumo" 205 Diesel. Dr. Mader (the gentleman without a hat) is in charge of the technical development department of the Junkers Works.

abilities of its engines. Although the Packard Diesel is now considered obsolete during these trials it showed the inherent characteristics of low fuel consumption, low fuel cost and freedom from fire hazard. Time has not changed these characteristics which today make the Diesel the only *safe* engine for aviation.

At a S.A.E. meeting in this country in June, 1937, Mr. Pitchford, a well-known British engineer, laid himself open to criticism when he

stated that "from the military point of view, the advantage in favor of the Diesel in reduced fire risk is not considered important." Undoubtedly everyone is entitled to his opinion, yet it stands to reason that when practically all of the fire hazard can be eliminated from heavier-than-air craft by using Diesel engines, this advantage is of paramount importance. Surely when a plane has crashed, its occupants, if they are stunned or injured, are entitled to be rescued? If this learned engineer had to fly a plane or work in one for his livelihood, or had lost friends or relatives in these terrible fires on the ground and in the air, he would not, in all sincerity, make such a callous statement.

to his plane when in difficulties and tried to land it and his gunner. The gunner was thrown out or jumped out a few feet from the ground, and subsequently he recovered. The pilot could not get out, however, and he was burned to death before an audience of 5,000 people, including a number of Congressmen.

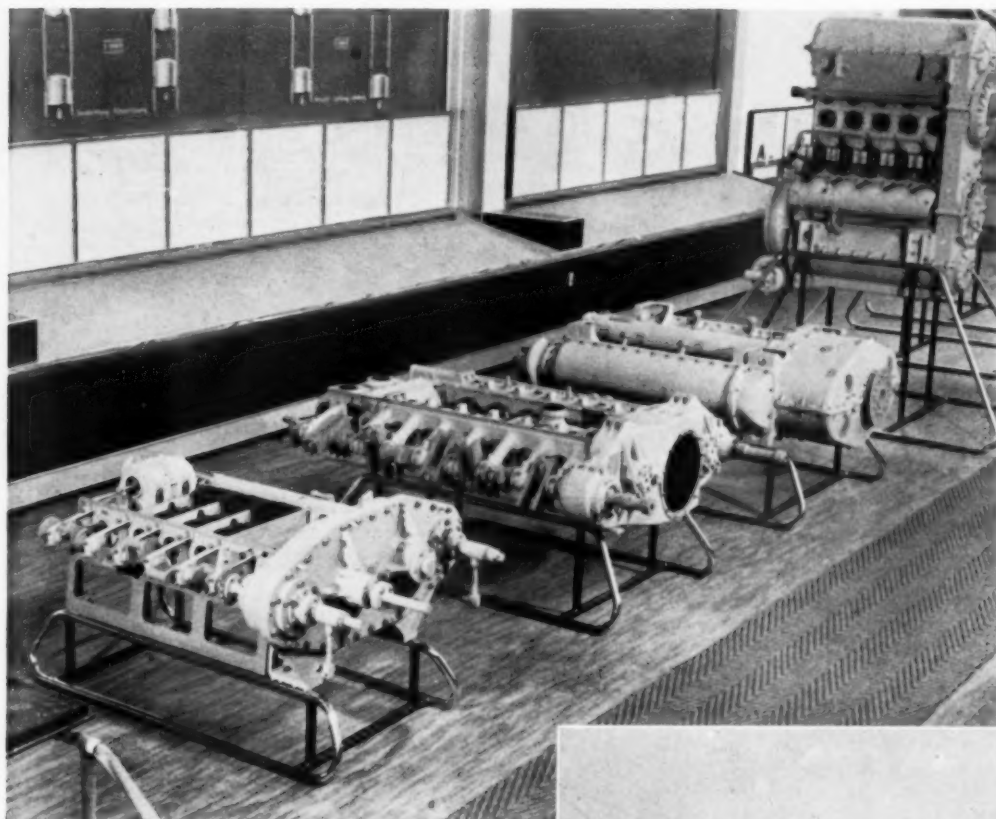
Commercial aviation, as might be expected, fared no better in 1937. During the past year there were at least fourteen fiery crashes and in at least two of these the fire originated in the air. Fifty-nine people were burned to death in these accidents. One of the worst tragedies in commercial aviation was when a huge airliner

caught fire and fell into the ocean near Panama last August, and fourteen lives were lost.

The record for the first six months of 1938 is not encouraging—government reports notwithstanding. So far there have been at least seven fiery accidents to military planes, with four fires originating in the air. Eighteen men have lost their lives and several more have been injured. Commercial aviation has had five major tragedies and at least two fires in the air, thirty-two people being burned to death—and no escapes reported. Blame for these "inexplicable" accidents often is placed upon the pilot, particularly if he perished in the wreckage. Then stereotype government notices appear: "Means of insuring against repetition of air disaster are being sought," and "U. S. Board studies airplane disaster," and the accident is conveniently forgotten. How could any intelligent conclusion be arrived at when the real reason for the holocaust is so studiously ignored?

Some day, perhaps, someone will write a book (and probably have to publish it himself) entitled, "Fire and Aviation." Material there would be in abundance, and photographs of the wreckage and the sufferers and the charred remains. Such a book would be an indictment, and a true one, of those who are neglecting safety in aviation for their own selfish ends. With this conclusive evidence in their hands, however, these "investigating committees" of experts might be forced by public opinion to face the facts, and some day they will be compelled to face the facts.

The world's first helium-filled, Diesel-engined airship. View of the United States Goodyear "Defender" with its air-cooled Diesels.

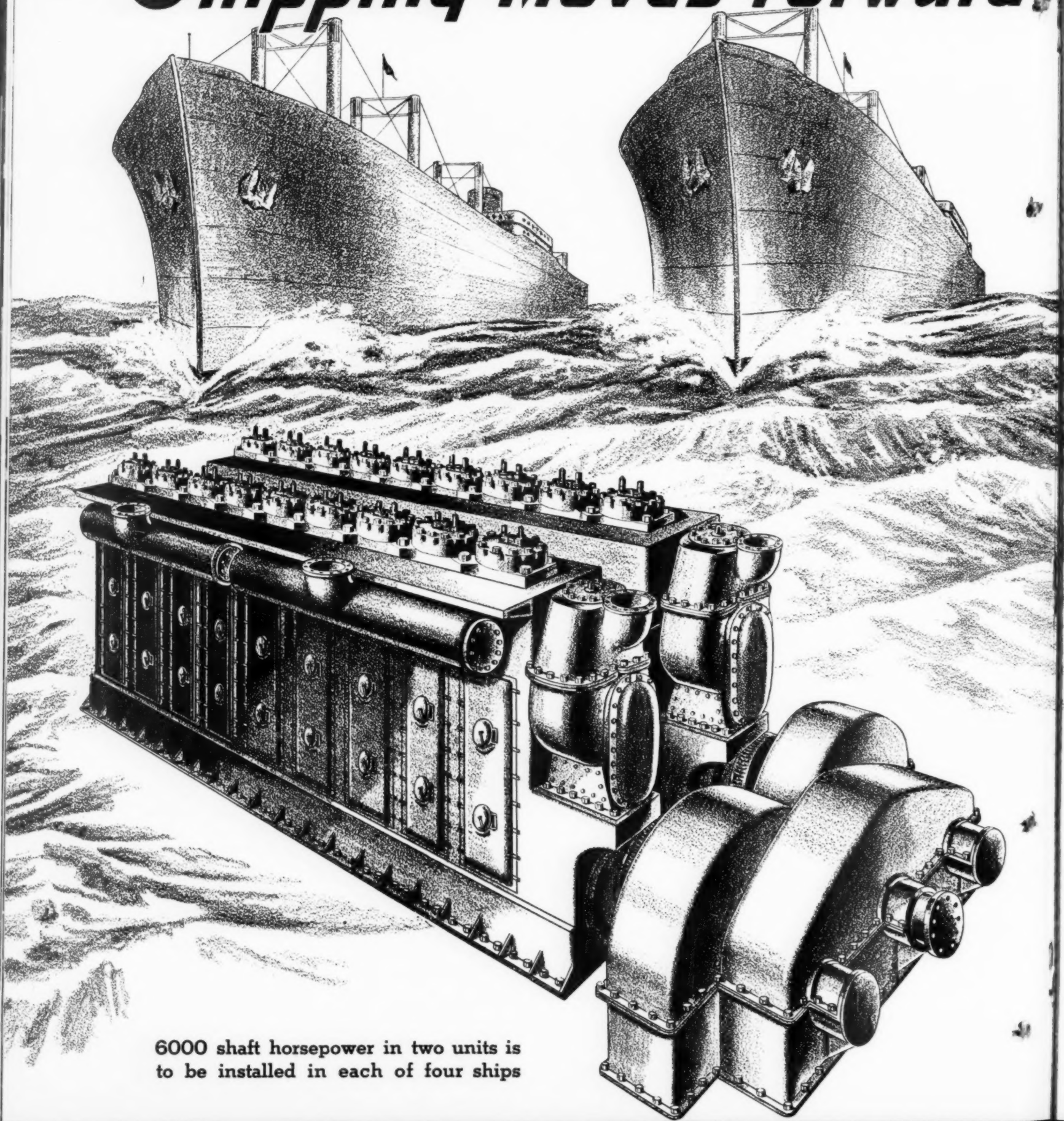


Progressive development of Junkers airplane Diesels from 1913 to 1928, showing the early horizontal type of engine which is claimed to be so desirable for wing-mounting in the airplane of tomorrow.

Looking over the newspaper reports for the United States for 1937 (since our government is afraid to publish such statistics), one finds that in military aviation there were at least thirteen serious accidents involving fire in which eighteen lives were lost and several men injured. In four of these accidents the plane caught fire in the air. One of the most spectacular tragedies was the loss of an Army Air Corps two-place pursuit plane at Langley Field last December when a very brave pilot stuck



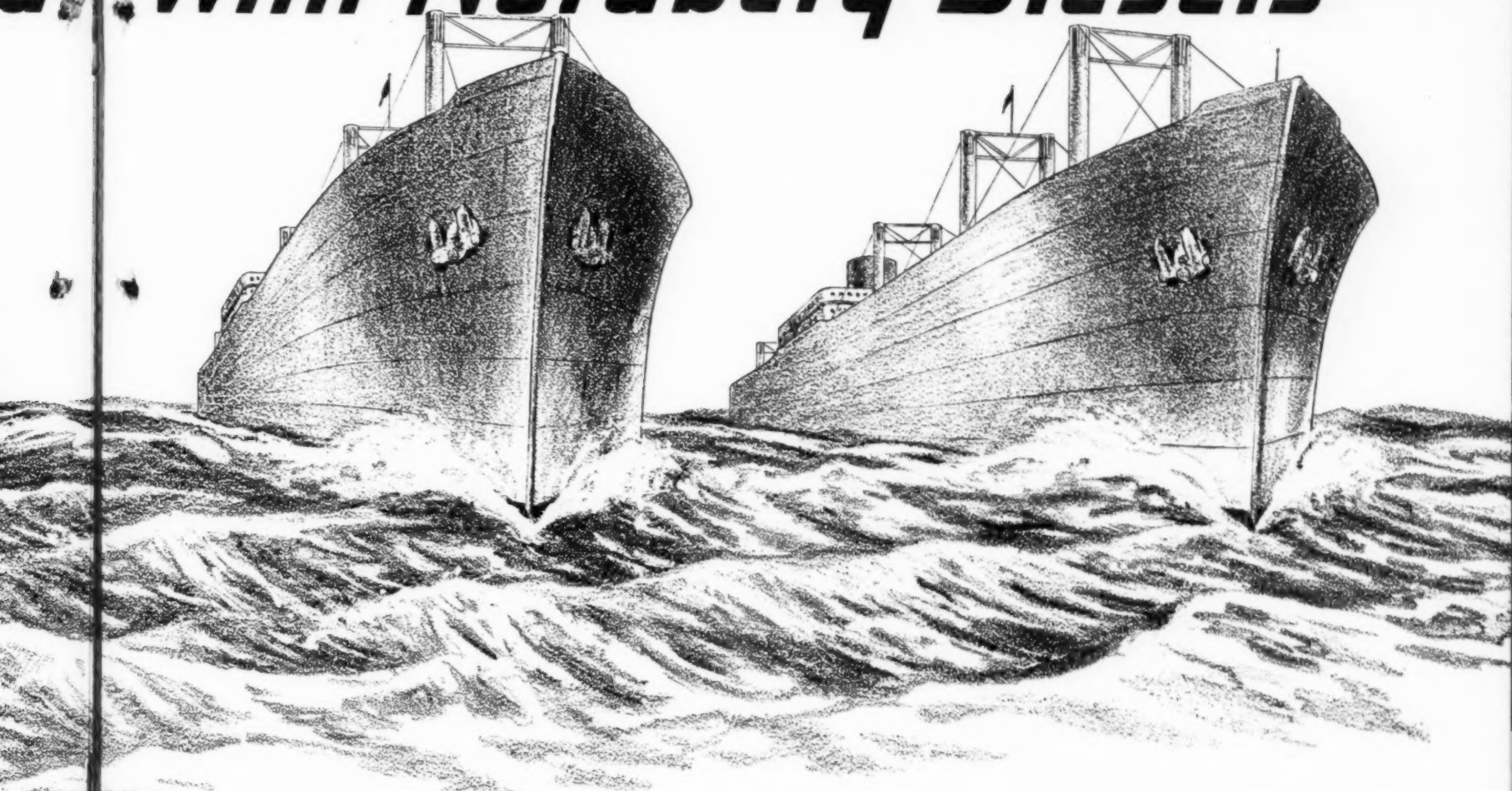
AMERICAN *Shipping Moves Forward.*



6000 shaft horsepower in two units is
to be installed in each of four ships

NORDBERG MARINE

With Nordberg Diesels



Maritime Commission Awards First Four Cargo Ships To Tampa Shipbuilding and Engineering Company Nordberg Diesels Selected

Diesel propulsion for the first four C-2 Cargo Ships to be built for the Maritime Commission, marks a new era of merchant ship construction in America. The ships will have a length of 459 feet, beam of 63 feet, displacement of 13,900 tons and speed of 15½ knots. Two Nordberg, nine cylinder, single acting, two cycle, direct reversible engines of crosshead construction will be installed in each ship. These engines will develop a total of 6000 normal shaft horsepower at 225 R. P. M. and will drive a single screw propeller through a gear reduction unit at 92 R. P. M.

NORDBERG MFG. CO., MILWAUKEE, WIS.

DIESEL ENGINES



NORDBERG DIESELS

for the U. S. Maritime Commission's Cargo Vessel Type C-2

By GEORGE D. CROSSLEY

THE U. S. Maritime Commission recently approved the bids submitted by the Tampa Shipbuilding and Engineering Company for building four Diesel-engined cargo ships.

In sponsoring the Diesel-engined cargo ships, the U. S. Maritime Commission had three objectives in view, namely: A reasonably fast, economically operated cargo vessel which could compete with the vessels of other nations; lowest possible first cost by the standardization of design and equipment; a vessel with sufficient speed and stability for use as a naval auxiliary in time of national emergency.

To satisfy these fundamentals, the specifications call for a steel cargo ship with two complete steel decks, i.e., a shelter deck and a second deck, a third steel deck fitted below the second deck. The hull is to be provided with seven watertight bulkheads and there will be five cargo holds, three forward of the engine room and two aft. Tanks are to be provided forward and aft in No. 2 and No. 4 hold to carry oil or liquid cargoes, water ballast, or ordinary general cargo. The general dimensions of the type C-2 Diesel-motor ship are as follows:

Length over all, app.....	459 ft.
Length between perpendiculars.....	435 ft.
Beam, molded	63 ft.
Draft, full loaded, molded	25 ft. 9 in.
Depth, molded to shelter deck.....	40 ft. 6 in.
Shaft horsepower, normal.....	6,000 hp.
Speed, full load draft.....	15½ knots
Displacement	13,900 tons
Light weight of vessel, app.....	4,680 tons
General cargo	7,618 tons
Fuel oil, app.....	1,501 tons
Water	73 tons
Crew and stores.....	28 tons
<hr/>	
Total cargo	9,220 tons
Grand total	13,900 tons

The propelling machinery for the Diesel powered cargo vessels of "C-2" design will consist of two Nordberg, two-cycle, single-acting, mechanical injection, direct-reversible, vertical Diesel engines with attached scavenging blowers and motor driven auxiliaries, such as lubricating oil pumps, cooling water pumps, fuel oil transfer pumps, etc.

The pair of engines will be connected through a hydraulic coupling to a common reduction gear unit for driving the single screw. The normal horsepower delivered to the propeller shaft will be 6,000 at a propeller speed of 92 rpm. and an engine speed of 225 rpm. The engines are rated to provide 10 per cent overload continuously, amounting to 3,300 shaft hp. at a propeller speed of 95.1 rpm. and an engine speed of 232.5 rpm. They are also designed to deliver 25 per cent overload for two hours, which is 3,750 shaft hp. at a propeller speed of 99.2 rpm. and an engine speed of 242.5 rpm.

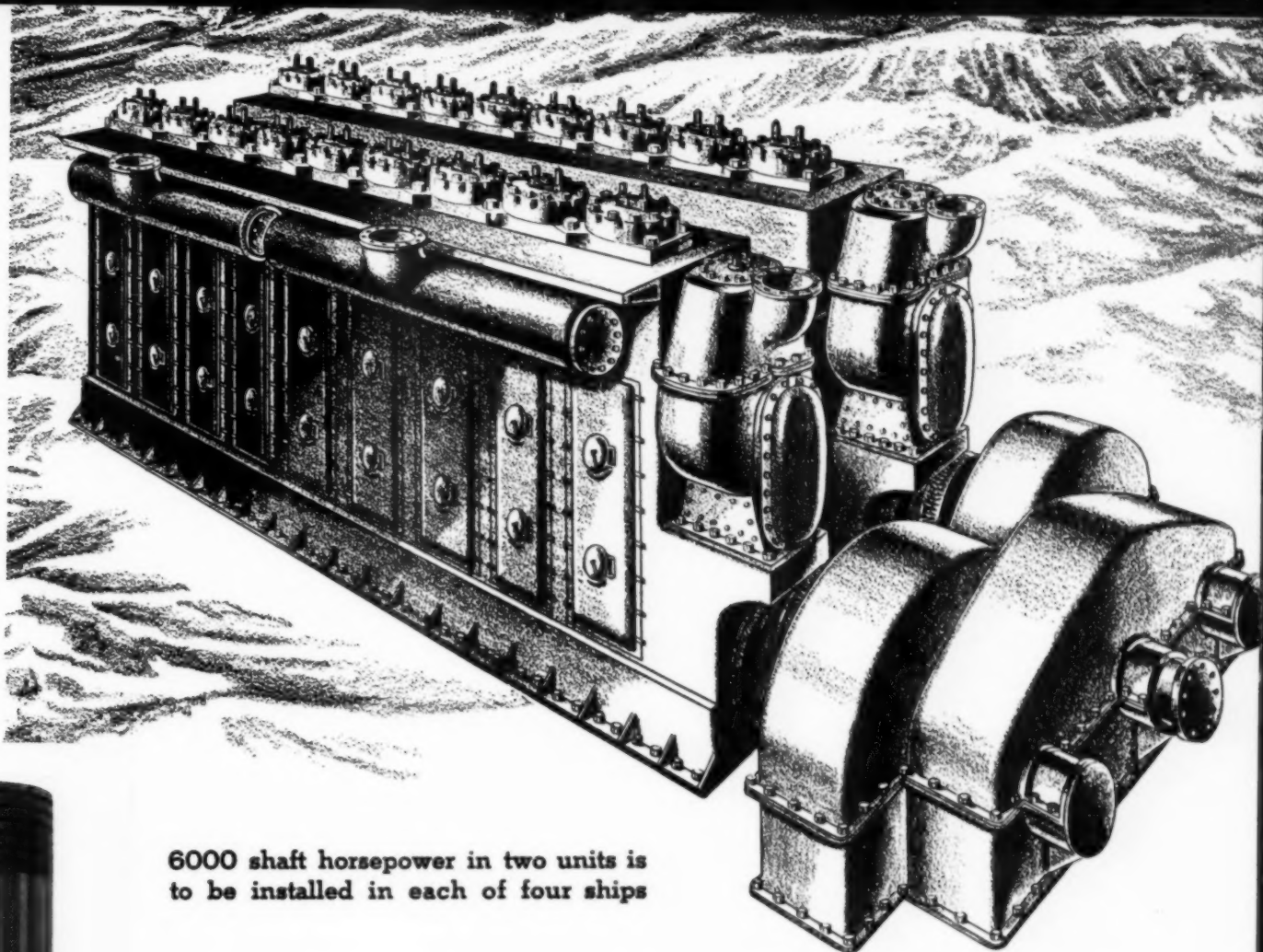
The engines will be of nine cylinders, each of 21 inches bore and 29 inches stroke, with port scavenging, fully enclosed and fitted with force feed lubrication. Automatic scavenging valves control the flow of air through the inlet ports. Scavenging air is supplied by rotary positive displacement type blowers, gear driven from the crankshaft and mounted on each engine at the aft end. The reversing mechanism is of the Burmeister and Wain type.

The engine bedplate is made of cast iron in two sections and contains the main bearing seats. The main frame consists of a series of cast iron "A" frames mounted on the bedplate to form a rigid support for the cast iron cylinder blocks. The spaces between "A" frames are enclosed with aluminum covers provided

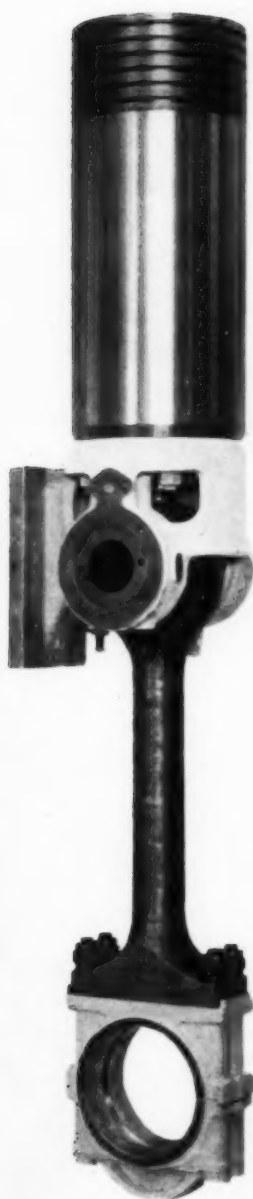
with hinged inspection ports. The cast iron cylinder blocks, frames and bedplates are assembled with tie rods or through bolts, which are designed to relieve these cast iron members of tensional stresses. These tie rods extend from the bedplate below each side of the main bearings to the top of the cylinder blocks and are tightened by means of a special hydraulic jack to produce the same stress in each rod.

Each cylinder is provided with a removable liner having scavenging ports on one side and exhaust ports on the opposite side. The cast iron cylinder heads have a central opening where the fuel valve is mounted and provided with openings for air starting, relief and indicator valves. The heads are water-jacketed and provided with covers for cleaning and inspecting the jacket spaces. Fuel injection valves are of the differential pressure operated type located in cages fitted with removable water-cooled nozzles. Starting valves of the air operated pilot piston type are located in cages in each cylinder head. The cylinder relief valves are also located in cages.

The pistons are of two-piece construction made of cast iron and are bolted directly to the crossheads. The piston head carries the packing rings and contains the oil cooling arrangement through which lubricating oil is circulated at high velocity. The cooling oil is brought up through hollow drilled connecting rods, then out to one side through the hollow crosshead pin and by copper tubing to the piston head. Cooling oil leaves the piston through another tube down to the opposite side of the crosshead pin and out through a free running telescopic pipe back to the engine sump. The piston head is attached to the trunk or skirt which, in turn, is attached to the crosshead,



6000 shaft horsepower in two units is to be installed in each of four ships



Nordberg piston and crosshead type connecting rod assembly.

and transmits the piston load through to the crosshead, thereby eliminating piston rods. The bottom end of each main cylinder liner is fitted with wiper rings and lantern gland of special design, which wipe the piston to return the oil to the crankcase and collect contaminated oil from the cylinder walls. These lantern glands are piped to drain contaminated oil outside the engine.

The engines are equipped with crossheads and gib type guides. The pistons are, therefore, entirely clear of the cylinder walls and liner wear reduced as piston rings alone bear against the walls. The crosshead bodies are made of cast steel with slipper type shoes and crosshead guides are made of cast iron, rectangular in shape, and are bolted between the "A" frames along the inboard side of each engine. Crosshead pins are steel forgings.

The crankshaft is a forging made of steel. The shaft is drilled through the crank webs, pins, and journals, to provide through passages for lubricating oil from the force-feed system. Connecting rods are also steel forgings with upper ends fitted with bushings lined with babbitt; the bottom ends are fitted with steel marine

type crank pin boxes equipped with removable steel shells lined with babbitt.

Hand levers for engine control and reversing are mounted on each engine and interconnected with the central control stand.

One central control station is furnished for the pair of engines located conveniently in the engine room. Gauge boards on which are mounted the required gauges, tachometers, revolution counters, exhaust pyrometers, and direction of rotation indicators are placed conveniently at the central control stand.

Each engine is equipped with a regulating governor of the centrifugal type, gear driven from the crankshaft and capable of maintaining any desired speed from 50 per cent full power to full power with not more than 5 per cent variation of the desired speed. An independent overspeed pendulum governor of the Burmeister and Wain type, designed for automatic resetting, is provided to cut off the fuel supply when the engine revolutions exceed 15 per cent of the designed service speed. The overspeed governor can be manually adjusted, while the engine is in operation, to limit the engine speed to approximately 5 per cent or 10 per cent over the actual operating speed down to 60 per cent of the operating speed. The action

of the overspeed governor with the ship cruising through heavy seas is such that when the propeller load is momentarily relieved, due to the vessel pitching, the fuel pumps are first limited to half load pumping and if the speed is not corrected by this action, a secondary trip cuts the fuel pumps off to idling position. This action makes it possible for the ship to proceed at a good rate of speed without any undesirable racing of engines when the propeller load is suddenly relieved by pitching of the vessel.

Fuel oil is delivered to the injection valves in each cylinder head by individual high pressure injection pumps of the plunger type. The pumps are cam operated from the camshaft, which is gear driven from the crankshaft.

The force feed lubricating oil system is supplied with oil by motor driven pumps, which take their suction from sump tanks built integral with the hull and located between engine supporting girders under the bedplates. These sump tanks will also receive the oil coming from the hydraulic couplings, since the same oil is used for lubricating the engines and that required for the couplings. A portion of the

lubricating oil is discharged through duplex strainers, thence through tubular oil coolers to each engine, while the remainder is discharged into an overhead tank for gravity feed to each hydraulic coupling, from whence it is collected in the sump tanks for re-circulation. Each engine lubricating system is complete in itself, although the two systems are interconnected and valved so that oil from one system may be used in the other engine in an emergency. A third motor driven lubricating oil pump and a tubular cooler are provided for stand-by service. The working parts of the engine are lubricated from this force feed system, but the major portion of the oil circulated is used to cool the piston heads by circulating through them at high velocity. The oil leaving the pistons is returned to the sump after passing through individual chambers where the flow may be inspected and the temperature is measured by indicating thermometers. The power cylinders are lubricated by unit type mechanical force feed lubricators.

Each engine is equipped with a motor driven turning gear, consisting of a variable speed reversible motor combined with suitable reduc-

tion gearing arranged to mesh with teeth on the flywheel rim. The turning gears may readily be engaged or disengaged and are interlocked with the engine starting controls.

Starting air will be supplied by two motor driven starting air compressors, each of 90 cfm. free air capacity, compressing up to 500 lbs. per square inch pressure. Two starting air receivers will be furnished for each ship having sufficient capacity for 12 starts of the two main engines, plus 25 per cent extra capacity for starting the ship's Diesel generating units and for the ship's air service.

The construction of these four vessels and the installation of the Diesel machinery will be watched with keen interest by the whole industry. When these vessels are completed an opportunity will be then offered of actually comparing their operating costs with steam driven vessels of exactly the same dimensions.

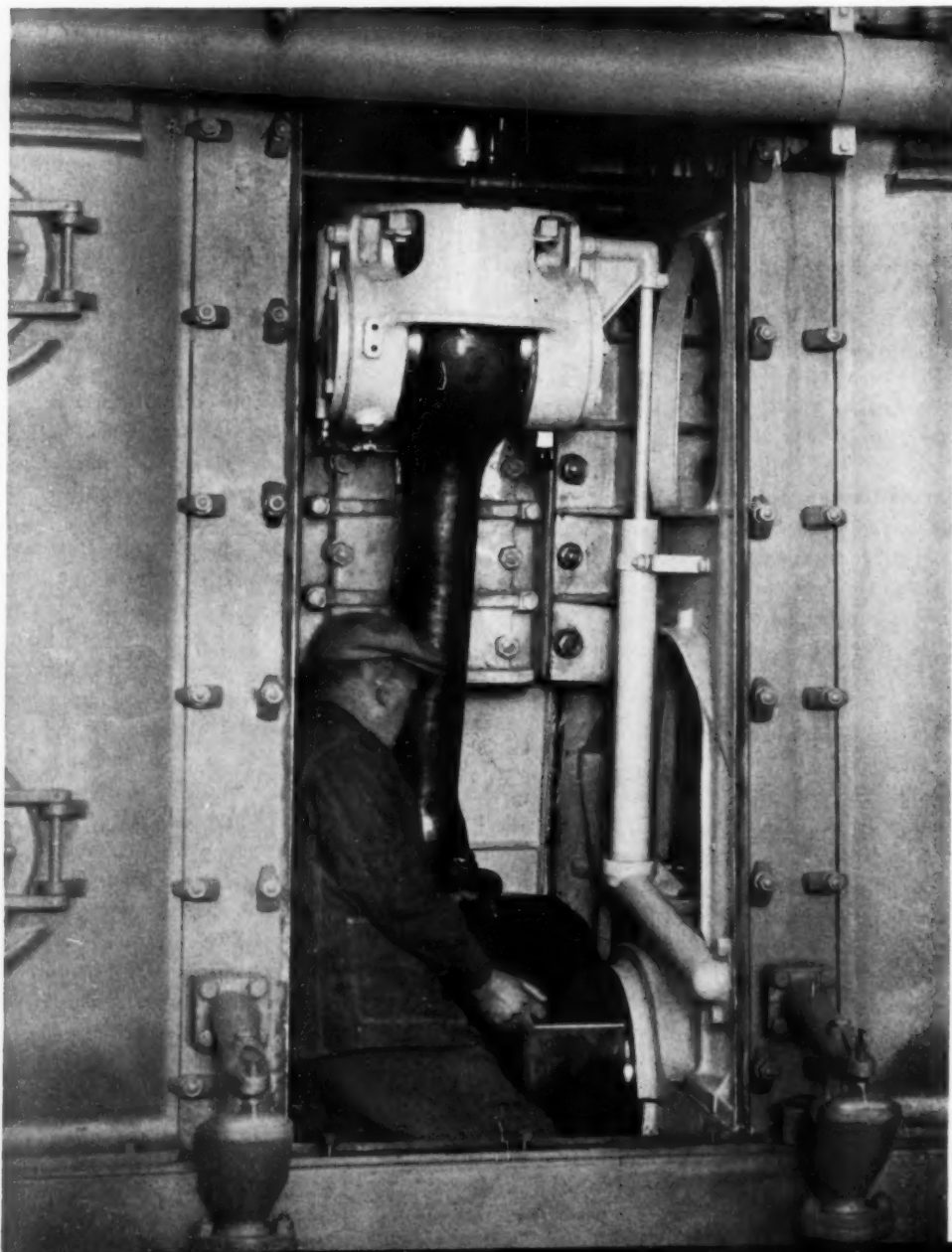
The Maritime Commission is to be congratulated on putting through this Diesel program, thereby giving the Diesel industry its first real opportunity to prove that Diesel driven cargo carriers can be just as economical, just as dependable in operation as the Diesel driven cargo carriers constructed and operated abroad.

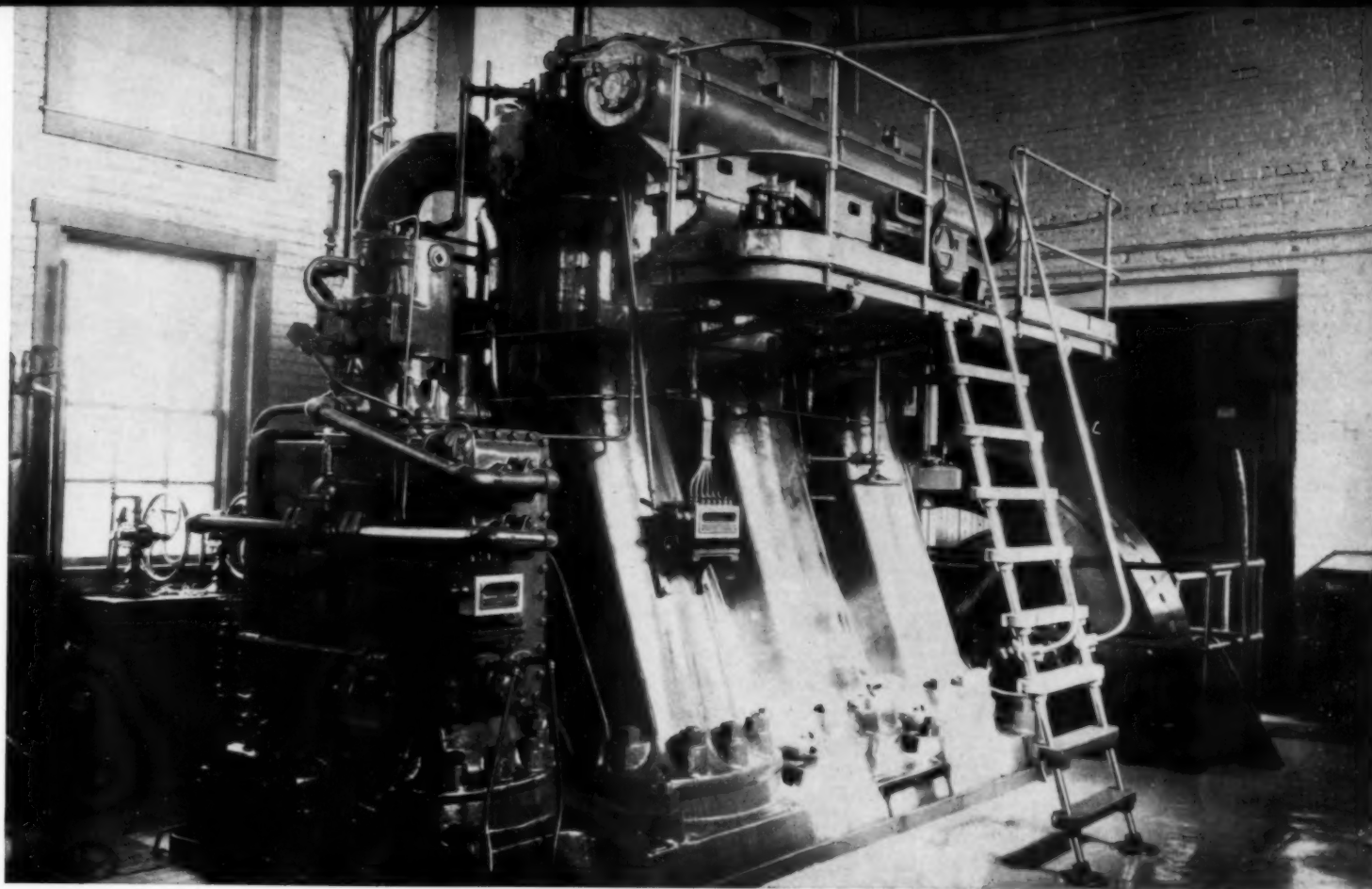
The Nordberg Diesels selected for these first four vessels are standardized, proven units. The hydraulic couplings through which they will drive into the reduction gear box are likewise tried and proven units. There is nothing unusual or untried about a reduction gear drive. All in all, the machinery installation for these vessels has been carefully and very intelligently laid out and selected. The general effect of the machinery layout is to achieve minimum space requirement, ease of operation and maintenance and an over-all compactness unobtainable in a steam driven vessel of the same size.

Our congratulations go out to the Nordberg Manufacturing Company and to the Tampa Shipbuilding and Engineering Company on the closing of this splendid contract with the Maritime Commission.

Taken in conjunction with the order recently placed by the Maritime Commission for six Type C-2 cargo carriers to be built by the Sun Shipbuilding & Dry Dock Company, to be powered with Sun-Doxford Diesel engines, and these four Diesel powered ships, the U.S.A. is now on its way to get a modern fleet of motorships.

Large, light-weight aluminum doors permit easy access to interior of Nordberg engine.





One of the two Fulton air-injection Diesels rated at 285 hp. and direct connected to General Electric generators installed in 1919.

PAWHUSKA, OKLAHOMA

By ORVILLE ADAMS

PAWHUSKA, deep in the heart of the Osage country, the home of the wealthy and dominant Indian tribe of Siouan stock famous for their oil riches, was a genuine frontier town in the early 1900's. The early discovery of oil and gas was the first indication that destiny selected this locale for the enactment of one of the most dramatic and colorful episodes ever to occur on the American scene, where every "in-jun" could own a Packard and have thousands a year to spend to the delight of the white man. If ever a country already wild went really wild and remained that way for thirty years, the Osage was that country. The town developed rapidly seeking modern advantages and, even before 1907, we find Pawhuska using gas lights for their buildings and streets. That year, however, they built their first electric light plant, and strangely enough it was located on the banks of Bird Creek, famous in history, a site that was several feet below high water level. They had neither time nor inclination for en-

gineering in that day, but the first big rain brought in experience what they lacked in engineering.

While the Diesel and gas engine were not entirely unheard of at the time, the first light plant naturally enough consisted of two Brownell boilers rated at 100 hp. each, and one high speed 150 hp. Brownell steam engine belted to a 90 kw. Fort Wayne generator. Activity grew apace and, by 1910, an addition was built, this time on higher ground about fifty feet from the original site. A second-hand 200 hp. Bates Corliss engine belted to a 150 kw. Westinghouse generator was installed. A sheet iron building covered the engine and generator, and it cost but .04 cents per kwhr. to generate current. Nevertheless, two years later, the city was building a brick building over this engine large enough to accommodate additional machinery and forthwith installed a Chuse four-valve Corliss engine rated at 227 hp. and belted to a 150

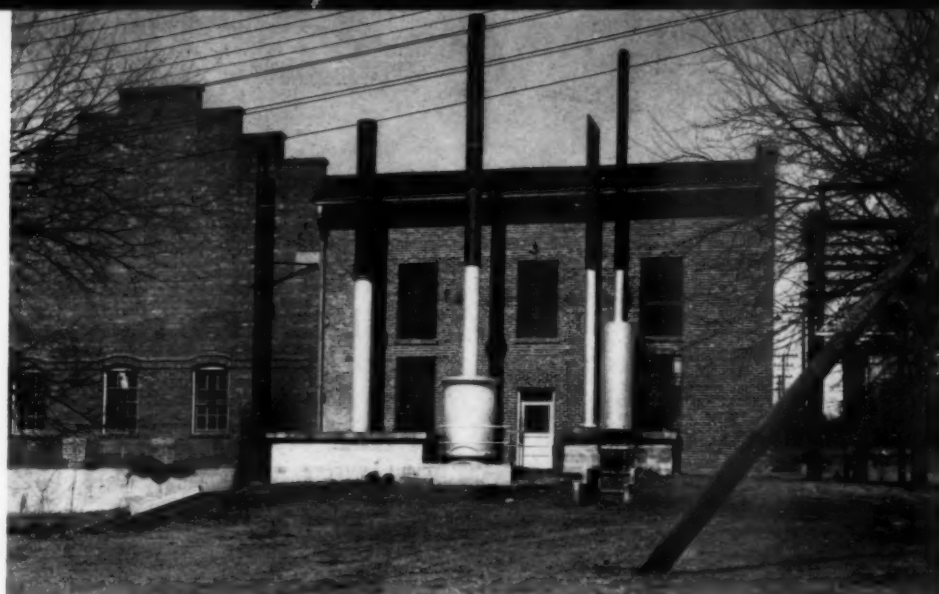
kw. General Electric generator, at the same time installing three Scotch-marine type boilers rated at 125 hp. each. They were then able to get the cost of producing current down to .03 cents per kwhr.

With the growth of the city and the arrival of the Diesel engine, the city removed the belted Corliss engine and installed two Fulton air-injection Diesel engines rated at 285 hp. each, direct connected to General Electric 192 kw. generators. Immediately the load increased, and for two years the city continued to operate this mixed plant, running the two Diesel engines continuously, with the steam engine handling the peak load excess, as was the general practice in those days. At the close of 1921, these engines were carrying the full load to an over-load, and the city decided to remove the old steam engines which were to be replaced with another Diesel engine some time later. However, the installation of the third Diesel

engine was postponed and on January 30, 1922, the city entered into a contract with a high-line to buy the current they could not make with their own plant. The rate charged commenced at 5 cents per kilowatt with a sliding scale down to as low as 2½ cents per kw. with a stiff primary charge. At this time the steam plant was shut down, and the two Diesel engines ran with full load continuously until November 1, 1922, when for some reason, the city plant was shut down and all current purchased at .02½-cent flat rate. For ten months when all current was purchased, the city paid out to the high-line \$49,822.50 for current, an amount which would have purchased a large Diesel engine.

The city immediately started up its own plant again and made current at an overhaul cost of .01½ cents per kwhr., which saved them between \$2,000 and \$2,500 per month over the cost of purchased power. Sufficiently comparable data was then at hand, and we find the city installing its third Fulton air-injection Diesel engine in January, 1925, a duplicate of the other two. These engines were the 3 cylinder, 16½" x 24", 200 rpm. air-injector, four cycle A frame type engines, all of which are still in daily use.

The first two years in operation these engines operated about 6000 hours per year, with a repair bill of less than \$25.00 for the total time.



Pawhuska, Oklahoma, municipal Diesel plant.

according to the records kept. The records show that the three engines, all direct connected to General Electric generators, each had a separate meter for measuring its output and a fuel oil meter for measuring the fuel used. The switchboard consisted of three generator panels and a voltage regulator, one totalizing panel, nine circuit panels, and was manually controlled. A DeLaval separator was used to purify the lubricating oil. A ten-ton crane over the engine provided means of handling the engine parts, and fuel oil was stored in two 10,000 gallon tanks. The cost in 1927 for producing current in this plant was shown as .01¼ cents per kwhr. The Pawhuska light plant had be-

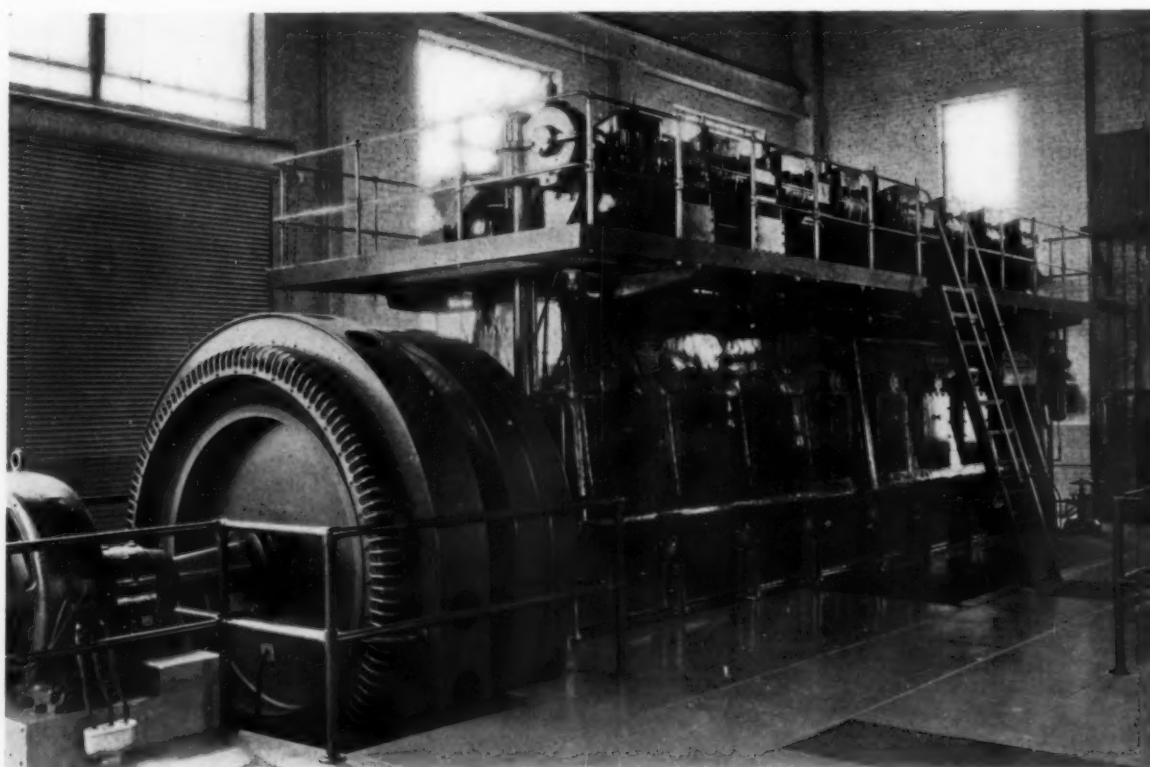
come an outstanding typical Diesel plant more than 10 years ago. In that year it generated 2,099,800 kwhrs., with an itemized cost as follows:

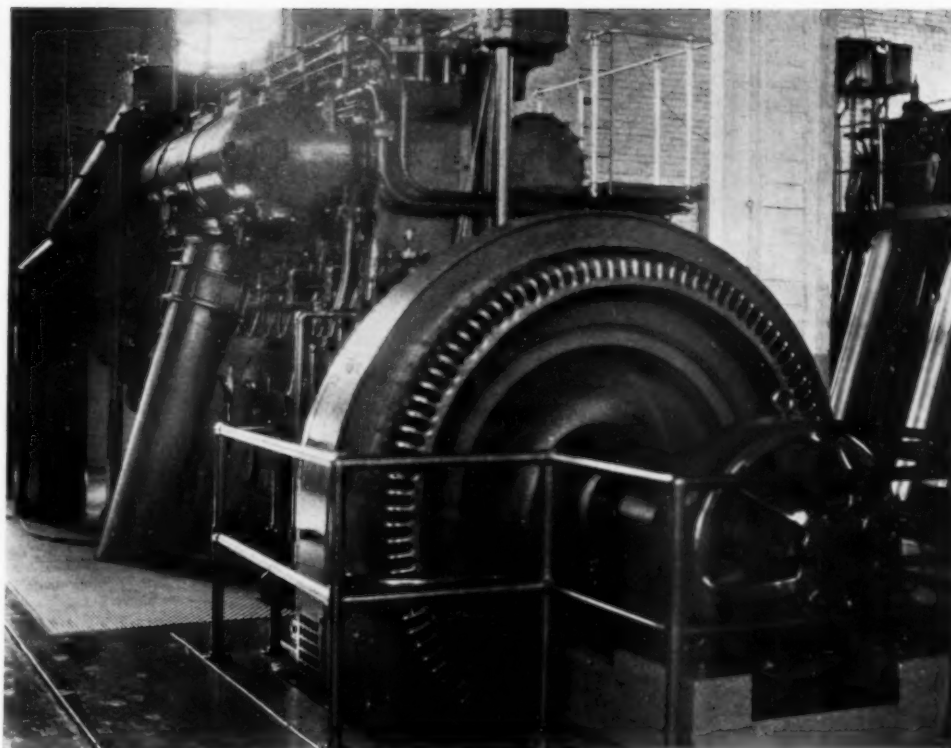
Fuel Oil	\$10,179.68
Labor	8,030.00
Repairs	454.00
Miscellaneous	1,013.85
Compressor Oil	71.05
Cylinder Oil	434.67
Crankcase Oil	492.44

Total Cost \$20,675.67

Such was the condition which continued until 1932 when the city purchased a Busch-Sulzer,

1,000 hp., 4 cycle, 8 cylinder Fulton air-injection Diesel, latest addition to Pawhuska plant.





750 hp., 5 cylinder, 257 rpm. Busch-Sulzer engine installed in 1932.

750 hp. 5 cylinder, 257 rpm. air-injection Diesel engine, 14 $\frac{3}{4}$ " x 21" bore and stroke, direct connected to a General Electric generator. This engine assumed most of the load to give the engines which had already seen 12 years service a rest.

Improved service and adequate capacity, together with increased use of mechanical refrigeration and air conditioning quickly increased demand and, with the large earnings which the city had enjoyed, a new engine was purchased and installed early in 1936, this time, a 1000 hp. 4 cycle, 8 cylinder, Fulton air-injection engine, directly connected to a General Electric generator, operating at 225 rpm. The auxiliary equipment consisted of American air filters, DeLaval centrifuge and Brown pyrometer, with a Maxim silencer on the exhaust. The city now has 2600 horsepower capacity in daily operation.

The progress made in ten years since the above report on operating cost is reflected in the present output and operating cost as shown below:

OPERATING EXPENSE	
Compressor Oil	\$ 77.38
Cylinder Oil	673.19
Crankcase Oil	246.40
Fuel Oil	11,099.99
Elec. used in engine room at cost	372.35
Salaries	6,875.00

Special Service	207.26
Miscellaneous	1,149.19
Total Operating Cost	\$20,695.76
Output of Plant	3,010,400 kwhrs.
Cost per kwhr.00687 cents.
Average kwhrs. per gallon fuel	9.97

HOURS EACH ENGINE OPERATED	
No. 1 1,000 hp.	5,315 hrs.
No. 2 285 hp.	1,175 hrs.
No. 3 285 hp.	709 hrs.
No. 4 300 hp.	1,543 hrs.
No. 5 750 hp.	3,230 hrs.
Total engine hours	11,968
Hp. hrs. developed	4,035,389
Hp. hrs. per gallon of cylinder oil	2,685
Plant factor	60%

Out of the total power generated the following was used by the city for which no revenue is received, which amounts to approximately 25% of the total power generated. About 10% of the total current is accounted for as line losses and unmetered current used in the engine room. The city sells only about 60% of the total output.

DISPOSITION OF CURRENT, 1937	
Used in Engine Room	37,285 kwhr.
Used in White way	91,200 kwhr.
Used in Street Lights	118,920 kwhr.
Used for Pumping Water	473,300 kwhr.
Total Free Current	720,705 kwhr.
Total Generated	3,010,400 kwhr.

It will be seen that while the output of the plant has increased approximately 33 $\frac{1}{3}$ % in ten year, the operating expenses remain practically the same, due in part to the difference in the cost of fuel now and in 1927. Salaries are somewhat less.

The net income from the utilities is sufficient to run the entire city as well as make extensive improvements and apply some of the revenue to the sinking fund. It received revenue as follows:

Electricity	\$98,511.30
Water	32,619.16

The city has had no general tax levy for the general fund since 1926. And during the ten years it bought its excess current from the high line, it paid out approximately \$300,000 to the high line, or an average of about \$30,000 a year until this contract expired in 1932. It can be easily seen that the light and water plant is paying better than \$100,000 a year net profit.

The plant is operated under the supervision of Mr. W. T. Williams, chief engineer, together with three operators and three assistant operators. The city is governed by a body of five commissioners, one of which is the mayor, and managed by a city manager. The city light and water office, and the general accounting is handled by Mr. Chas. M. Hirt, who kindly furnished the writer with detailed financial information concerning the city for the past 20 years. As shown by their rate schedule, the city enjoys a very reasonable cost of current to the consumer. As Mr. Williams, chief engineer, puts it, "When the citizen pays his light and water bills, he is paying his taxes for fire protection, police, city hospital, park and street expense, for his white way and his street lights. And he has his municipal light and power plant to thank for it, with its five efficient Diesel engines," he emphasized.

Here again we find a chief engineer of a Diesel plant, insisting that the net kilowatt hours per gallon of fuel is only one of several factors in Diesel economy, and even this depends largely on conditions over which the engineer may have no control. Long life and low repair cost is considered to rank with fuel economy as a chief element to be realized. The Diesel engines first purchased by the city operated for 18 years without liner replacement. No major repairs have been made. The older engines have had double seal rings in them for more than three years. There is no intention to replace liners. The larger engine is to be equipped with these rings. The plant hasn't been down in fifteen years. Such a record is one to be proud of by an engineer.

GROVE CITY, PENNSYLVANIA

By FRANK H. POEHLMANN*

GROVE CITY, Pa., is a community of some 6,300 inhabitants. It is located in western Pennsylvania, Mercer County to be exact, and is nearly 50 miles north of Pittsburgh as the crow flies.

Its municipally owned electric and water plant is not a recent venture, but a well seasoned enterprise. Grove City can look with justifiable pride over 30 years of successful operation of its city-owned plant.

Grove City's original electric light plant dates back to 1908, when the Borough began generating electricity with a horizontal 100 hp. gas engine, belted to a generator. This plant was increased in size and equipment from time to time and in 1923 it boasted three Cooper-Bessemer gas engines and two semi-Diesels of the same make.

During 1924, a completely new plant was erected at a new location. The electric and water plants were consolidated into one, so as to effect operating economies. The five oil engines were discarded and three 360 hp. Cooper-Bessemer Diesel engines, directly connected to General Electric, three phase 60 cycle, three wire 2,400 volt alternators, each of 235 kw. capacity, were installed. The modernity of Grove City in choosing mechanical injection Cooper-Bessemer Diesels, and the up-to-dateness of the latter, may best be illuminated by saying that in 1924 most Diesels were still of the air-injection type and few cities "dared" to experiment with "solid" injection

engines. But then, some manufacturers, some users, must perforce do the pioneering. The Grove City plant is shown in Fig. 1.

The demand for electricity increased rapidly and but three years later, in 1927, another Cooper-Bessemer Diesel, but of 750 hp. at an engine speed of 240 rpm., was installed. The added capacity sufficed for the time being, but the Borough of Grove City made it its policy to possess a generating capacity with a reserve of at least one-third in excess of the normal demand. Thus, in 1930 another Cooper-Bessemer Diesel rated 930 hp. at an engine speed of 257 rpm. was installed to augment the generating capacity.

The continually rising demand for electricity was responsible for still another addition in 1937. Again a Cooper-Bessemer engine with an output of 930 hp., was chosen and placed in operation. The interior of the Grove City plant is shown in Fig. 2, with the latest Cooper-Bessemer Diesel in the foreground.

The treatment of the lubricating oil at Grove City is particularly interesting. While most Diesel-engine plants filter and cool the lubricating oil, the treatment given to the lube oil at Grove City is extensive, showing what can be done with the proper equipment.

The main lubricating-oil tank is divided into three compartments, each holding 600 gallons of oil. The compartments are piped into a common header, which furnishes lube oil to



Fig. 3. Lube Oil Purifying System. Hilco Oil Reclaimer Unit.

Fig. 1. Grove City, Pa., Diesel-electric and Water Plant.



all of the six Diesel engines. The oil is returned to the tank in use through another header and flows through an Anndale oil cooler before entering the tank. Directly below the tanks is a Sharples centrifuge, through which the dirty oil must pass before it is reclaimed by the Hilco Oil Reclaimer (shown in the foreground, Fig. 3). The capacity of this unit is 400 gallons per day, which permits the engines to receive clean oil every 24 hours. The effectiveness of the oil reclaiming process may be illustrated by saying that "new" oil

*Superintendent, Grove City Borough.

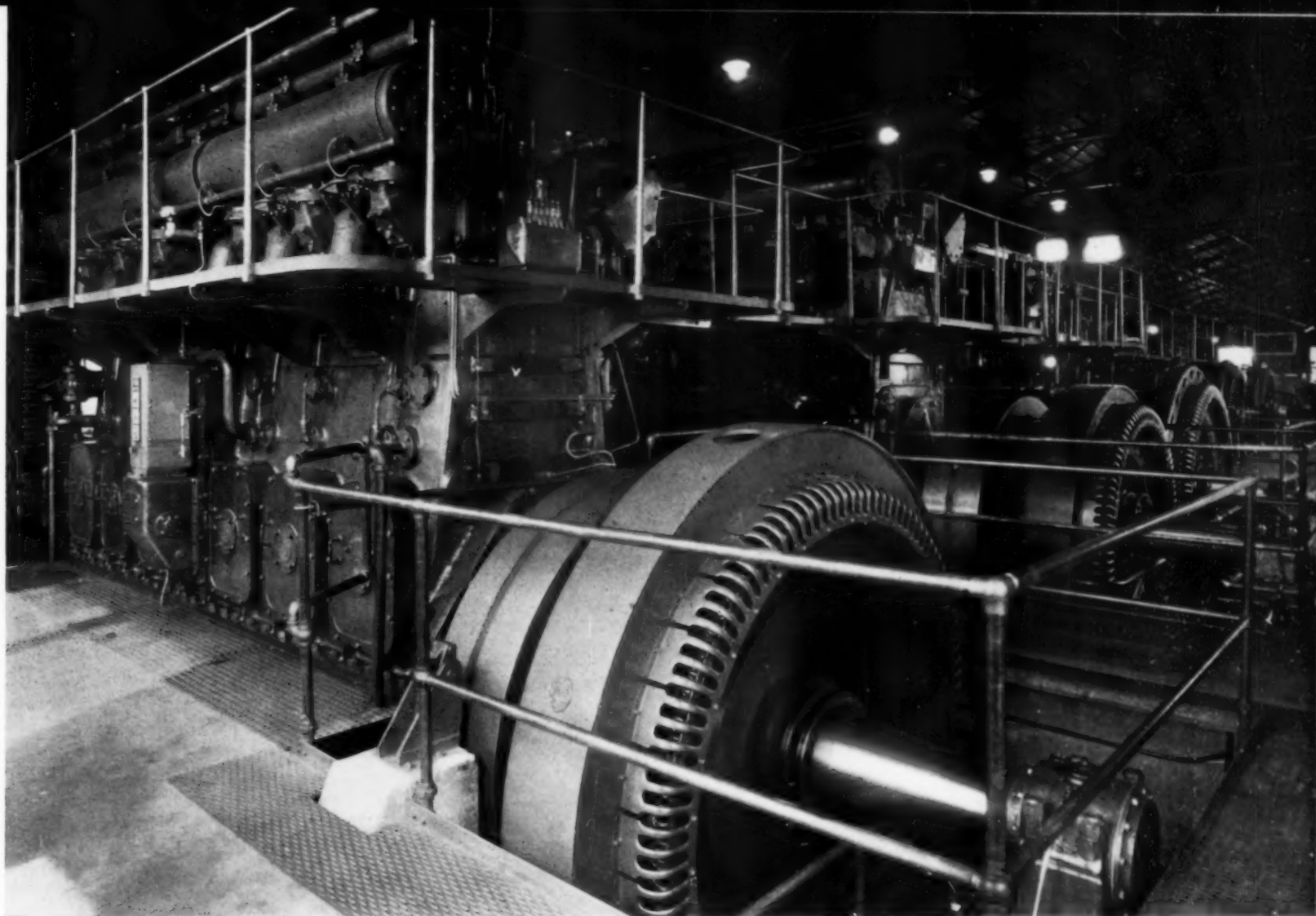


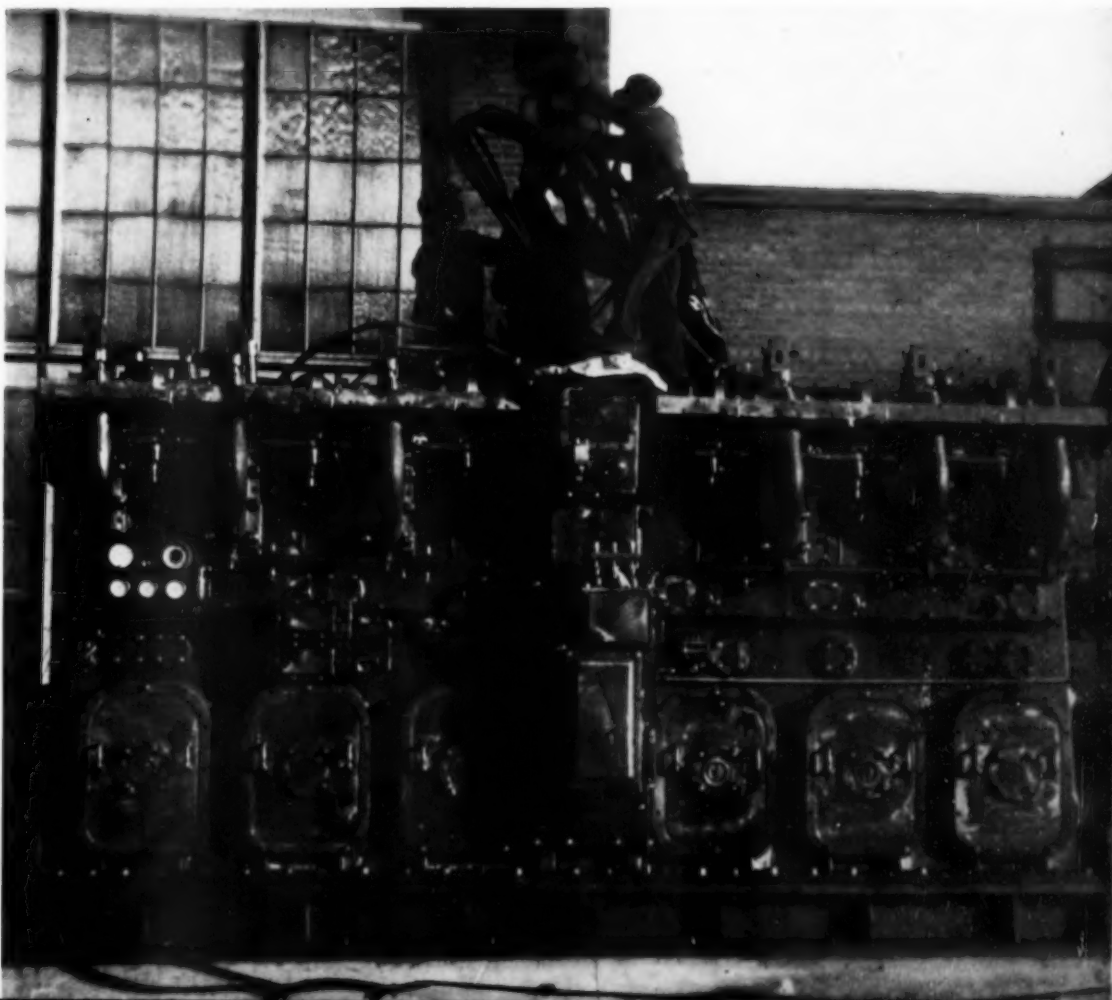
Fig. 2. Interior of Plant Showing Battery of Six Cooper-Bessemer Diesels.

possesses a viscosity of 594 and an acidity of 0.06, whereas reclaimed oily has a viscosity of 557 with an acidity of but 0.02. Thus, the reclaiming process furnishes not only suitable lube oil but also saves a considerable amount of money in reconditioning the lube oil for further use.

The growth of this municipal plant, covering a 12-year period, is shown in Fig. 5. The tabulation indicates that, while the number of customers increased but 32.75 per cent, the demand for electricity increased over 80 per cent. This proves that people will consume electricity in greater and ever greater amounts, providing current is furnished at a low cost such as only municipally owned plants can, or rather, will do.

Table Fig. 6 itemizes plant operation details

Fig. 4. The Arrival and Installation of the latest Cooper-Bessemer Engine.



Year	Energy Generated k.w.-hr.	Peak Load k.w.	Demand k.w.	High Day k.w.-hr.	Number of Customers	Average Use per Year Domestic--k.w.-hr.
1925	2,311,600	720	620	9,800	1,475	539
1929	3,549,600	1,100	907	12,700	1,757	628
1930	3,526,330	1,060	878	12,900	1,920	628
1935	3,843,800	1,190	1,008	14,300	1,834	606
1937	4,776,501	1,250	1,128	17,700	1,956	694

	Jan., 1937	Jan., 1938	Feb., 1937	Feb., 1938	Mar., 1937	Mar., 1938
Generation - k.w.-hr.	444,200	472,500	386,500	434,800	411,101	455,900
Peak load - k.w.	1,200	1,180	1,040	1,180	1,050	1,210
Demand - k.w.	1,008	1,152	960	1,176	960	1,104
High Day - k.w.-hr.	16,500	17,000	15,400	18,000	15,400	18,500

Fig. 5. Tabulated 6-Year Operating Record.

Fig. 6. (Below) Itemized Plant Operation Details.

Fig. 7. (Right) Standard Rates at Grove City, Pa.

Plant Operation in the Year 1937	
Gross Generation, k.w.-hr.	4,776,501
Plant Use, k.w.-hr.	475,596
Net Generation, k.w.-hr.	4,300,905
Engine Operation, total hr.	20,247
Lubricating Oil Economy Rated h.p.-hr. per Gallon	2,499
Fuel Oil Economy, Gross k.w.-hr. per Gallon	12.3
Plant Operating Cost for the Year 1937	
Labor	\$13,500.47
Fuel Oil	19,684.44
Lubricating Oil	3,535.63
Water	580.74
Maintenance	3,057.04
Repairs	3,309.51
Miscellaneous	4,050.84
Total Operating Cost	47,718.67

Present Domestic Rates
 First 20 k.w.-hr., at 5 cents per k.w.-hr.
 Next 30 k.w.-hr., at 4 cents per k.w.-hr.
 Next 50 k.w.-hr., at 3½ cents per k.w.-hr.
 Next 100 k.w.-hr., at 2½ cents per k.w.-hr.
 All Over 200 k.w.-hr., at 1½ cents

Minimum Charge, \$1.00 per month; 10 per cent penalty for post-due payment. Water heaters, top element, 24 hr. use at domestic rates; bottom element, at ½ cent for 18 hr. limited use.

Present Commercial Rates
 First 60 hour use of active load at 5 cents
 Next 90 hour use of active load at 3 cents
 All over 150 hours at 1½ cents

Class A:
 90 per cent of the first k.w.
 80 per cent of the next k.w.
 70 per cent of the next three k.w.
 50 per cent of all over five k.w.

Class B:
 70 per cent of the first two k.w.
 50 per cent of all over two k.w.

Present Power Rates
 First 5,000 k.w.-hr., at 3 cents per k.w.-hr.
 All over 5,000 at 1½ cents per k.w.-hr.
 Off Peak Power, 12 hours, at 1 cent per k.w.-hr.

as well as operating costs; both are applicable for the year 1937.

Rates at Grove City have been consistently reduced, such reductions having taken place three times during 1927, 1930 and finally in 1935.

The present rate schedule is given in table Fig. 7, which quotes the very lowest demand at but 5c per kwh., tapering down to a flat ¼ of a cent rate for 18-hour limited use. Comparing these rates with those of any public utility, the money saving possibilities of a well managed municipally owned and operated plant are manifest.

The history of the Grove City municipal light and water plant is typical of that of many others of various cities and towns scattered all over the United States. The tabulation Fig. 8 shows what this plant has cost the Borough in capital investment, beginning with the new

plant erected and the equipment purchased in 1924 and the subsequent investments made up to the present.

Fig. 8. Cost Tabulation

Year	Cost of Item
1924	
New Plant, with three 235 kw. units, 705 kw. total	\$91,312.66
Cost per kw.	129.52
1927	
Cost of 450 kw. unit	44,206.07
Cost per kw.	98.24
1928	
Additional miscellaneous equipment	5,651.00
1930	
Cost of 630 kw. unit	52,018.51
Cost per kw.	82.57
1930	
Additional equipment, including cooling tower	8,536.07

1937	
Cost of 630 kw. unit and other equipment:	
Engine and generator	53,343.00
Generator panel	956.00
Wire and tape	297.89
Conduit and fittings	707.73
Building addition	5,967.00
Unit foundation	2,020.00
1 400-ampere Mg. set	1,340.00
1 compensator	186.00
1 Diesel exciter-compressor	2,498.00
1 500 gpm. pump	440.00
1 fuel trans. pump	61.60
1 extra oil cooler	448.00
1 oil tank	340.40
Floor plates	108.00
1 voltage regulator	575.00
Distribution panels	1,308.71
Meters	444.57
Switchboard material	447.28
Miscellaneous	21.89
Labor	2,215.76
Total cost, 1937 additions	\$ 73,726.89
Total cost of plant to date	\$275,451.20
To date, cost per kw.	\$ 114.06

	Income	Production	Distribution	Office	Total Operating Expense	Interest Sink. Funds Tax	Total Expense	Operating Surplus
1925	\$ 89,455.88	\$26,024.74			\$56,261.98	\$7,588.89	\$63,850.87	\$25,605.01
1926	96,923.78	32,900.95	13,295.41	2,217.22	48,413.58	7,117.65	55,531.23	41,392.55
1927	104,330.87	33,229.03	16,375.03	1,566.75	51,170.81	7,926.93	59,097.74	45,233.13
1928	98,460.57	39,984.82	14,752.98	3,095.10	57,832.90	5,521.14	63,354.04	35,106.53
1929	112,963.99	40,355.43	19,336.67	3,400.20	63,092.30	4,236.67	67,328.97	45,635.02
1930	105,476.73	35,260.31	14,223.98	4,516.53	54,000.82	3,720.00	57,720.82	47,755.91
1931	89,192.04	27,764.46	7,780.72	3,235.54	38,780.72	4,719.60	43,500.32	45,691.72
1932	85,713.40	27,371.70	8,407.11	2,860.60	38,639.41	3,751.00	42,390.41	43,322.99
1933	84,977.06	26,938.44	9,043.17	2,713.14	38,694.75	5,280.57	43,975.32	41,001.74
1934	94,924.44	29,594.45	8,948.55	2,904.47	41,447.47	3,213.53	44,661.00	50,263.44
1935	91,022.31	34,126.50	9,322.91	3,651.89	47,101.30	2,084.00	49,185.30	41,837.01
1936	103,031.38	40,661.11	13,553.24	3,651.67	57,866.02	2,093.48	59,959.50	43,071.88
1937	109,281.56	47,718.67	14,961.91	4,050.92	66,731.52	1,094.48	67,826.00	41,455.56
	\$1,265,754.01						\$718,381.52	\$547,372.49

Rate reductions 1927 - 1930 - 1935.

Bonds outstanding as of Jan. 1, 1938, \$18,000.00.

Fig. 8. Profits for 13 Year Period of Grove City's Municipal Plant.

It has been said that small plants, or rather, that the plants of small cities and municipalities, cannot possibly operate advantageously.

Fig. 8 will disprove this often heard assertion. We have here not merely one exceptional year, but a 13 year period. The total income reached the very imposing figure of \$1,265,754.01 while the entire expenses for this 13 year period totals but \$718,381.52 leaving a NET profit of \$547,372.49! An average yearly net profit of \$42,105.57 is a worth-while amount, and when one considers the fact that Grove City has but 6,400 inhabitants, one cannot but wonder how municipalities can afford to be without their own electric light plant.

EDITOR'S NOTE

AS WE were about to go to press, the illustration, Fig. 9, arrived. Believing that the extensive oil reclaiming system in use at Grove City,

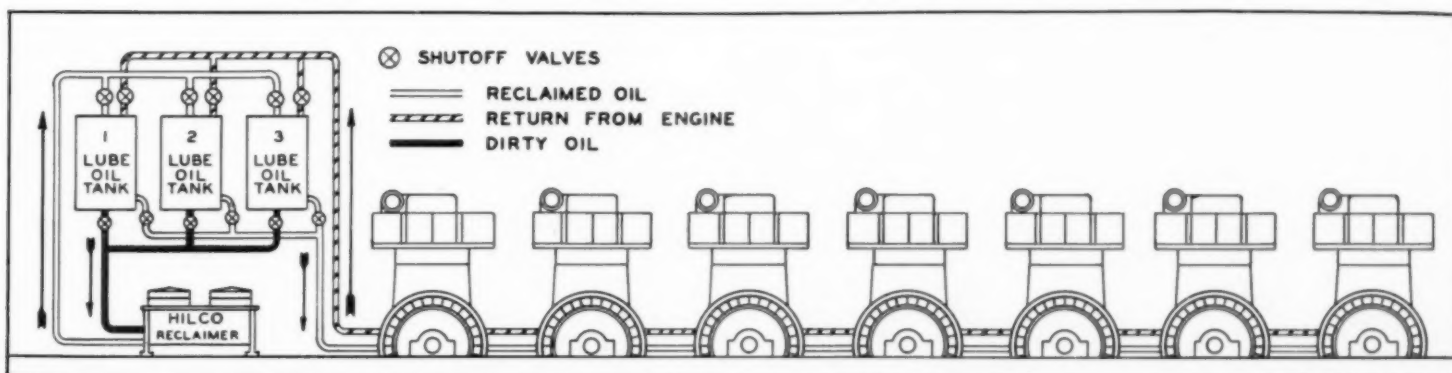
Pa., may be of interest to our readers, we are giving here a short description of the piping layout. As may be seen, the Hilco Oil Reclaimer is direct-connected to the lubricating system of the seven Cooper-Bessemer engines. This is a unique installation because the engines are operating on clean lubrication oil at all times. This is possible because the oil reclaimer produces an oil free from solids, moisture, gums, resins, fuel dilution and acid, and it is claimed that the so treated oil is as good as new oil. This particular installation has a capacity of 400 gallons per day, which is the quantity of oil in each of the lube oil tanks, Nos. 1, 2 and 3.

The reclaimer is so connected to the lube oil tanks that it can be used to reclaim all the oil from any one tank and deliver it to either one of the other two. It can also be used for by-passing purifying by simply taking the oil from the bottom of any lube oil tank and returning the purified oil to the top by a simple

manipulation of the valves. The preferred method and that generally followed is to reclaim all the oil from one tank and deliver it to an empty tank as follows:

Lube oil tank No. 1 is filled with clean oil at the start, and for a 24-hour period the engines are lubricated from this tank. Tank No. 2 is also full of clean oil, and during the next 24 hours the engines are lubricated from this tank. No. 3 tank is empty. The reclaimer now draws oil from tank No. 1, purifies and returns it to tank No. 3. On the following day the engines will be lubricated with the reclaimed oil from tank No. 3, while the dirty oil from tank No. 2 is being reclaimed and pumped in the now empty tank No. 1. From this continuous cycle of operation it is evident that the oil is in use but 24 hours, therefore, the oil does not accumulate excessive amounts of foreign matter or sludge. The entire arrangement is equivalent to draining the lube system every day and filling with new oil.

Fig. 9. Schematic Diagram of the Oil Reclaiming Unit at Grove City.





Diesel-engined Ferry "Governor Harry W. Nice."

THE FERRY "GOVERNOR HARRY W. NICE"

By B. J. VON BONGART

THE Claiborne-Annapolis Ferry Company has placed into service what is perhaps the most modern ferry extant. The vessel was designed and built by the Maryland Drydock Company, subsidiary of Koppers Company, and is 207 feet 6 inches long with a beam over guards of 62 feet. The draft is eight feet nine inches and the displacement is 977 tons.

The ferry is powered with an eight cylinder Fairbanks-Morse two-stroke cycle, marine type, direct reversible Diesel of 16-inch bore and

20-inch stroke. The engine is of the single-acting, solid injection, pump-scavenging type, delivering 1,400 hp. at 300 rpm. and propelling the vessel at a normal cruising speed of 12½ miles per hour.

In addition to the main propulsion engine, the ferry is equipped with two eight-cylinder Fairbanks-Morse Diesels of 5½-inch bore and 7½ stroke, each directly connected to 80 kw. 125-volt DC marine type generators. The total connected electric load on the generators

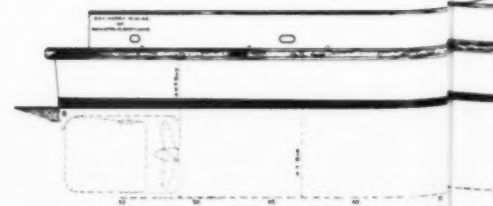
amounts to 76 kw. of which the running load is about 60 kw. Hence, each generator is capable of carrying any emergency load.

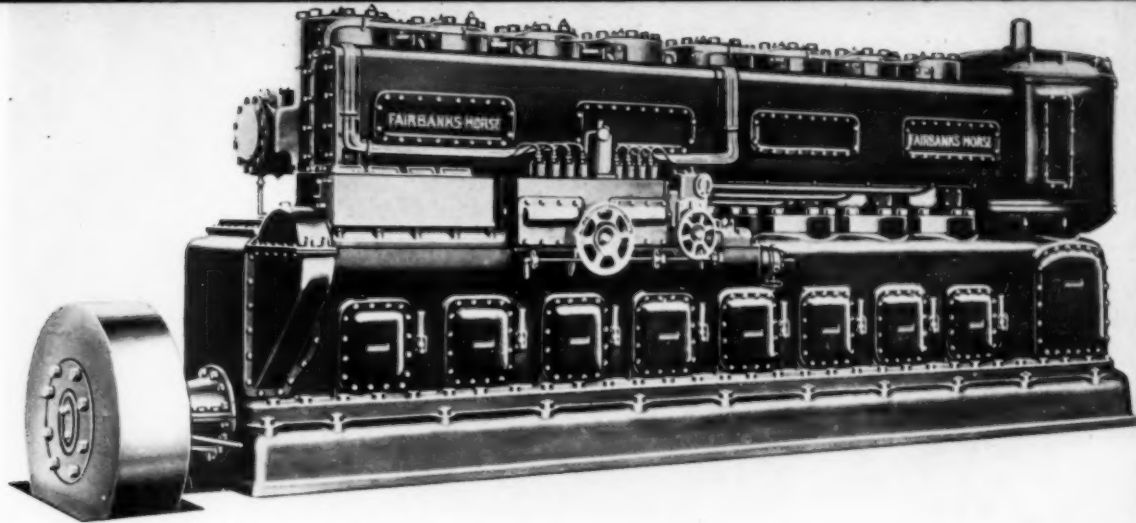
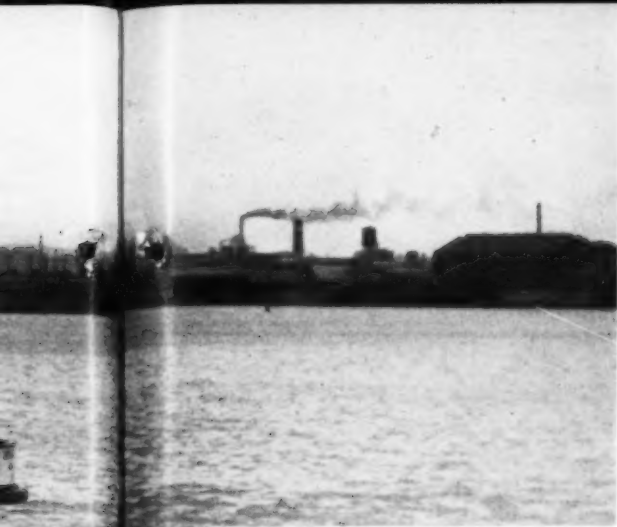
Another Fairbanks-Morse Diesel engine of 4¼-inch bore and 6-inch stroke drives a Gardner-Denver air compressor.

The engine equipment includes such standard auxiliaries as: Maxim exhaust silencer as well as intake silencer; Alnor pyrometer; Kingsbury thrust bearings; Poole flexible couplings and Sharples centrifuge.

The vessel is of all-steel construction, riveted or welded. The only wood used is for parts of the interior finish and for the fender guards around the all-steel hull. The latter is designed to withstand ice breaking, the shell plating in

The Promenade Deck.





Eight Cylinder 1,400 hp. Model 37-D-16 Fairbanks-Morse Diesel.



Outside view and Maryland Drydock Pier.

the way of the ice belt being one-half inch thick throughout.

There is a center house on the main deck, seven feet two inches wide, which encloses the engine casing, and this center house also provides toilet facilities for the crew and in addition accommodates the fire-proof stairs leading to the upper deck as well as those leading to the crew's quarters located on the lower deck in hold compartments adjacent to each end of the engine room.

The main deck has six lanes for vehicles and

accommodates 65 automobiles or motor trucks. A special water and vapor-proof lighting system illuminates the vehicle lanes. Fire mains, hydrants and a hose system provide safety which is further augmented by a sprinkler system of the zoned, dry pipe type and which is connected to the fire pumps.

The upper deck house is about 100 feet long, extending the full length of the upper deck. Here is the main passenger salon, 50 feet long and 38 feet wide, accommodating 730 passengers. A luncheon counter provides simple restaurant services. The passenger salon is situ-

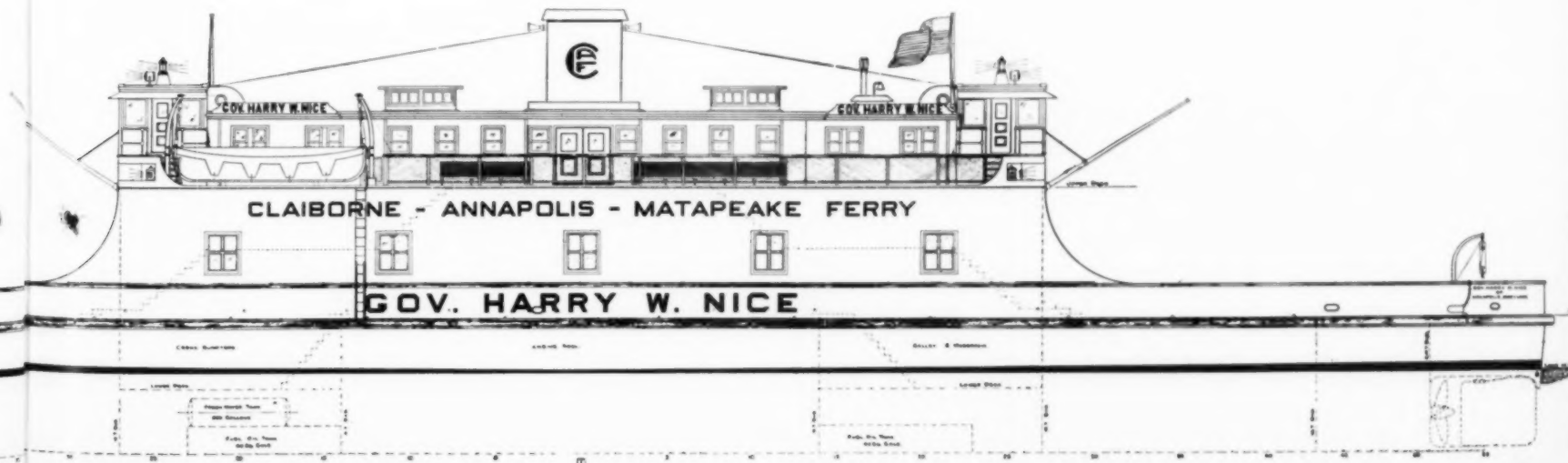
ated between the elevated pilot houses which contain four staterooms for officers and also comfort station for white and colored passengers.

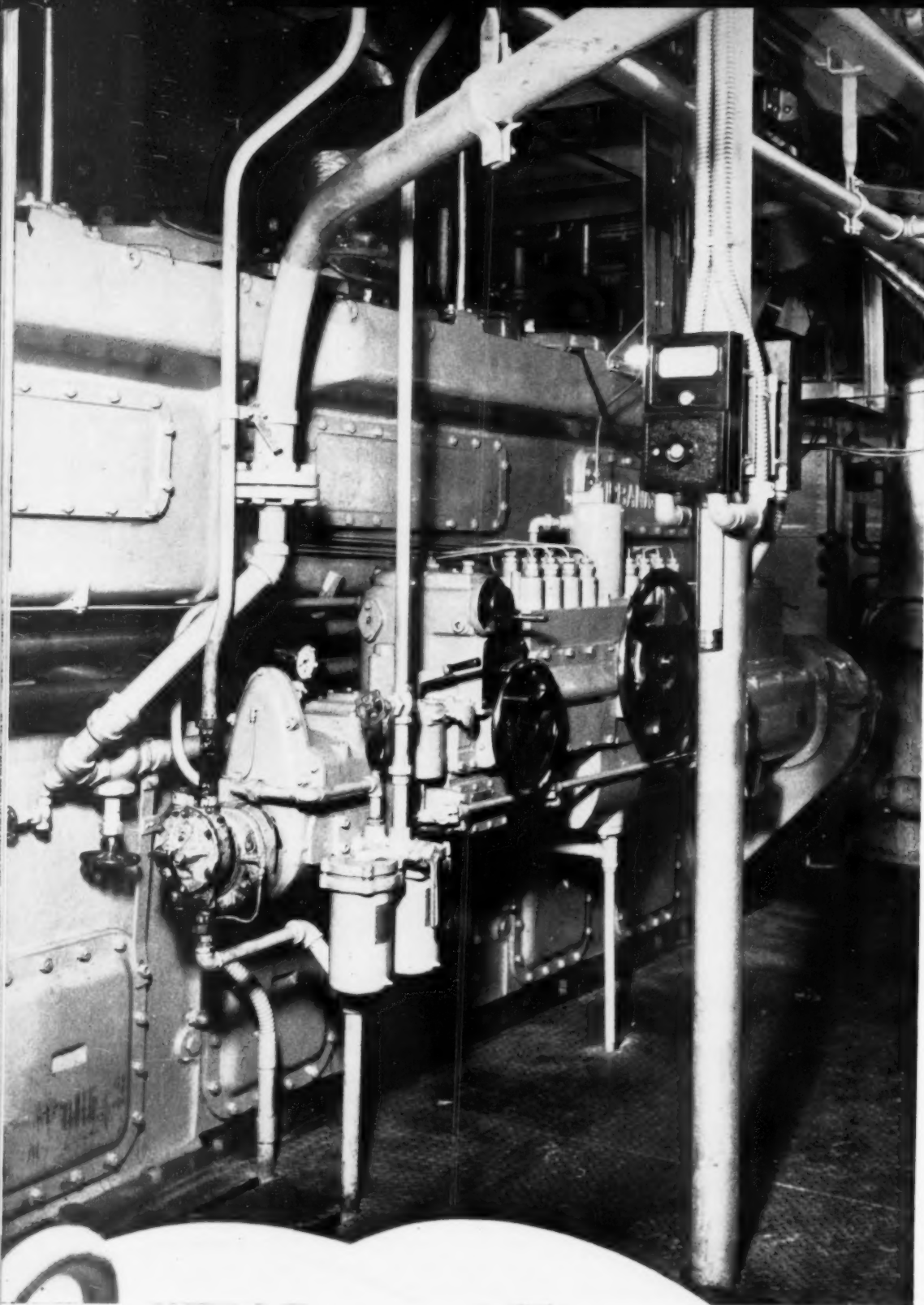
While the usual ferry contains no more than pilot houses and engine room, the *Governor Harry W. Nice* is fitted out not only with staterooms for the officers but also with accommodations for a crew of 22 men. These include sleeping quarters, locker room, mess room and a galley with a double range fitted with a carburetor for burning Diesel oil.

As said before, the hull is of all-steel construction, containing six water-tight main bulkheads. The vessel is classed A-1 Ferry Service with the American Bureau of Shipping and meets all the requirements of the Bureau of Marine Inspection and Navigation, it is stated by the Maryland Drydock officials.

Two balanced rudders, one at each end of the vessel, are operated by electric steering engines, arranged for hand operation in case of failure of the electric power. The rudders have cast steel frames covered with steel plates and they are filled with Hydrolene.

The double-ended, flared hull is subdivided by the six bulkheads in such a way that the vessel has ample freeboard and positive stability with any one of the six compartments flooded.





The Fairbanks-Morse Main Propulsion Engine Equipped with Nugent Filters and Alnor Pyrometer.

Eight thousand gallons of fuel is carried in two built-in double-bottom tanks, one located in each hold adjacent to the engine room. Potable water is carried in one 500-gallon cylindrical tank located in the hold. Electric operated drinking fountains are provided in the passenger salon.

One of the features of the *Governor Nice* is what amounts to air conditioning. The passenger salon is heated during inclement weather

with a force-fan warm air heating system which becomes a ventilating system during warm weather. During the summer months, gentle, cool breezes emanate from the air ducts, making the passenger salon of the *Governor Nice* a welcome retreat.

The discharge from the fan heaters is led through overhead ducts and escapes into the salon space through four combination diffusers and electric ceiling fixtures which, in associ-

ation with well-placed wall fixtures, complete the salon lighting system.

Mechanical ventilation of the engine room and crew quarters below the main deck is provided for with four blowers, two supplying the machinery space and two for the crew accommodations on the lower deck. Natural ventilation also is provided for the galley.

An oil-fired steam heating boiler is installed in the engine room and piped to fin-type cabinet radiators in all quarters, except the passenger salon, which as stated previously, is heated by two fan heaters directing warm air streams into the salon.

The *Governor Harry W. Nice* made its maiden trip on May 3rd last, speeding across Chesapeake Bay. On board were Governor and Mrs. Nice, Mayor Jackson of Baltimore, Emerson C. Harrington, president of the Claiborne-Annapolis Ferry Company, and several hundred guests, including Maryland representatives of the two major parties.

The vessel was named after the present governor of Maryland, Harry W. Nice (Republican), by Emerson C. Harrington (Democrat), who is the former governor of Maryland.

The keel of the ferry was laid at the ship-building yards of the Maryland Drydock Company on September 15th, last year, and when the boat was side-launched on December 11th last, Mrs. Nice christened the hull. On its maiden trip, the vessel flew the Maryland state flag and a yellow and black pennant, both gifts of Governor and Mrs. Nice.

The *Governor Harry W. Nice* is not the first Diesel-engined ferry of the Claiborne-Annapolis Ferry Company but rather its third. The first Diesel-engined ferry to be placed into service by this company was the *Governor Ritchie*, powered with two 360 hp. Fairbanks-Morse Diesels. This boat was commissioned for regular service in 1926.

It was the first Diesel-engined ferry competing with steam power ferries across Chesapeake Bay and the venture was so successful that another Diesel-engined ferry, the *John M. Dennis*, was added in 1929. The latter is powered with two 840 hp. Fairbanks-Morse Diesels.

The Claiborne-Annapolis Ferry Company has thus over twelve years of actual experience with Diesel-engined ferries and Fairbanks-Morse engines, and the fact that their latest ferry, the *Governor Harry W. Nice*, is powered with Fairbanks-Morse engines, speaks for itself.

DIESEL COAL TRUCKS

BY GEORGE D. CROSSLEY

DIESEL-ENGINED trucks are being used extensively for coal mine stripping operations in the mountainous anthracite coal fields of Pennsylvania. Instead of the coal being brought up from underground, it is uncovered by means of large power shovels, blasted and removed in much the same manner as stone or rock is removed from a quarry. The vein of coal may be fifty feet or more below the surface and a mile or more in length. The top soil or overburden is removed and the trench thus formed is usually forty to fifty feet in width.

In most instances, the trucks must travel over rough, uneven soft ground and over steep, winding grades, making this one of the most severe types of service for which dump trucks are used, and only trucks with super power and strength are able to render satisfactory service and withstand the strains.

Augmenting its present line of heavy-duty

motor trucks, the Sterling Motor Truck Company, Inc., has developed an exceptionally large dump truck which is particularly adapted to mine stripping operations. Known as Model HC250, it is the largest four-wheel truck built to date. Ordinarily, it is equipped with a heavily constructed dump body of twelve cubic yard water level capacity which permits hauling payloads of 18 to 20 tons, resulting in a gross weight of approximately 60,000 pounds.

It is powered with either a 677 cubic inch gasoline engine or a 672 cubic inch Cummins Diesel engine. Dual transmissions provide twelve forward speeds and three reverse. Final drive is by means of heavy duty 2 in. pitch sprockets and chains. An exceptionally large solid round axle with over capacity wheel bearings and 13.50/24 dual tires permits the carrying of these large loads over rough terrain.

The frame sidemembers are formed of $\frac{5}{8}$ in. thick alloy steel and heat-treated. The chan-

nels are 12 in. deep the entire length and lined with $1\frac{3}{8}$ in. thick seasoned white oak. All frame crossmembers are heavily gusseted and securely bolted in place.

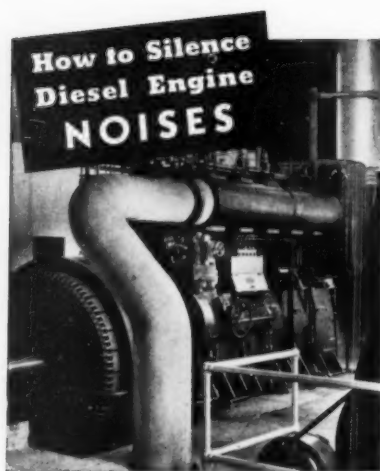
The standard wheelbase for dump chassis is 177 in. and this is suitable for a body twelve feet long.

Four wheel air brakes are standard. The front brakes are $17\frac{1}{4}$ in. diameter, and 3 in. wide, and the rear are 19 in. in diameter, and 6 in. wide.

The rear springs, both main and auxiliary, are 5 in. wide and have a carrying capacity of 52,000 pounds.

This model has been designed for "off the highway" operations where the going is difficult and trucks are subjected to unusual strains. It has already proven a super truck in the coal fields of Pennsylvania.





... without Loss of Power



Side and end views of a Burgess HDF Exhaust Muffler.

To muffle Diesel exhaust noises is easy. But to muffle Diesel noises without sacrificing engine power is not so easy. Yet Burgess straight-through mufflers will do just that!

There are no baffles in Burgess mufflers. They pass exhaust gases with no more restriction than a straight pipe of equal size. The straight-through construction is made possible by the patented Burgess acoustic lining, consisting of a perforated facing, backed by an efficient sound absorbent. This lining effectively blots up and absorbs high pitched noises. Low pitched noises are suppressed by reactance chambers. Hence, the muffler gives effective silencing with maximum engine efficiency.

Burgess offers a complete line of mufflers, silencers, and air cleaners for internal combustion engines. Included in this line are heavy duty units for stationary engines and lighter duty units for portable engines. Write for bulletins.

Burgess Battery Company, Acoustic Div.,
Dept. DPR, 500 W. Huron St., Chicago

In England — Burgess Products Company, Ltd.
Barwell, Leicester.

Licensed under C. F. Burgess Laboratories, Inc., Patents.

BURGESS ACOUSTIC

AIR CLEANERS AND SILENCERS BREATHERS CAPS MUFFLERS
ENGINE HOODS EXHAUST TREATMENT AND ACOUSTIC DUCT LINING



DIESEL ENGINE MANUFACTURER BUILDS NOVEL FLOAT

CELEBRATING the 150th Anniversary of the Settlement of the Northwest Territory, the City of Mount Vernon, Ohio, recently played host to the band of modern pioneers that is retracing the route followed by those first hardy settlers who started from Ipswich, Massachusetts, in 1788 and made their way into the wild vastness of the territory now included by the states of Ohio, Illinois, Michigan, Indiana, Wisconsin, and part of Minnesota.

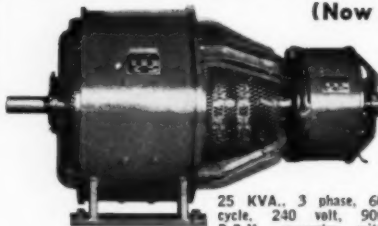
With general offices and one of its plants located in Mount Vernon, the Cooper-Bessemer Corporation, makers of Gas and Diesel Engines and Compressors, designed and built the float pictured here for the parade of more than fifty

floats which was a part of the celebration program.

Observing its own 105th Anniversary this year, the Cooper-Bessemer Corporation's float carried a modern Diesel engine as an example of its present day contribution to industry and an old sugar mill, built in 1860 by what was then the C. & G. Cooper Company. Used for many years on an Ohio farm for pressing juice from sorghum cane, the mill was finally purchased a few years ago by the company at an auction of farm goods. Having been turned by a pair of horses, this old sugar mill, with its double-tree hanging from a stout beam, formed a strong contrast with the modern 120 hp. Diesel engine.

COLUMBIA A. C. GENERATORS

(Now Available with Automatic Voltage Adjustors)



25 KVA., 3 phase, 60 cycle, 240 volt, 900 R.P.M. generator with direct connected exciter.

SIZES
1 to 156 KVA

SPEEDS

1800, 1200, 900, 720, 600 R.P.M.

SHIPMENT

One Week to 10 Days

Liberal Resale Plan to Dealers
and Engine Manufacturers

COLUMBIA ELECTRIC MFG. CO., 4503 HAMILTON AVE., CLEVELAND, OHIO

DIESEL TRACTOR MINE EXCAVATION

AN unusual dirt moving operation, illustrated below, has been assigned to Diesel tractors. The photograph shows one of two combinations of Allis-Chalmers Diesel tractors and Continental scrapers which are being employed digging the opening shaft of a new mine at Herrin, Illinois. In making this excavation, which will be 65 ft. deep and 300 ft. in diam-



eter, the Consolidated Coal Company of St. Louis is departing from customary procedure in shaft construction by the use of this type Diesel tractor-scraper unit. When the excavation is complete it will be covered by a large building which will house hoisting and other mine machinery. Naturally, the shaft proper will narrow to a much smaller diameter.

In this view the tractor has backed the scraper up the side and will pick up a load as it goes forward. Just another of the many new fields of application for economical and dependable ft. haul with each load of dirt from the pit. Both Diesel tractors are working on a twenty-one hour per day schedule.

PORTABLE BRINELL HARDNESS TEST

ALIGHT weight, portable Brinell instrument that can be carried easily right to the job is said to simplify metal hardness tests in the field, remote from laboratory facilities and around industrial plants. According to the manufacturer, it can be used in close quarters and can be applied to parts and equipment the size of which have, heretofore, made testing difficult, expensive and sometimes virtually im-

possible. It eliminates both the necessity of dismantling equipment to be tested and transporting specimens to the laboratory.

Known as the Telebrineller, the instrument was developed to check and control the rebuilding (welding) and heat treating of rail ends. Its simplicity, convenience and the ease with which it can be carried are indicated by the fact that the combined weight of the outfit and carrying case is only 6½ pounds. According to the manufacturer, it is not affected by hot or cold weather and is built to stand hard use. No training or previous experience, it

is claimed, is necessary to operate it accurately. In addition to its more obvious uses in many types of plants throughout the metallurgic industries it also has a number of uses in plant maintenance work. It is proving valuable wherever an accurate knowledge of metal hardness is a factor in safety and continuous operation. The outfit is composed of the Telebrineller instrument proper, a bar of known hardness, a microscope with a scale etched in its focal plane and a slide rule, packed with extra test bars and impression balls in a small case.

For further information write the Editor.

throw away used lubricating oil?
NEVER!
and there is no need to operate engines with dirty crankcases

YM OIL PURIFIERS remove



fuel dilution, acids, water, gums, carbon, tarry material, dirt, and sludges effectively, economically . . . in the simplest, common-sense way . . .

SEND US TWO GALLONS OF YOUR USED LUBE OIL

to be purified in a standard Y-M unit. By inspecting the samples you will see what Y-M could do in your service. Then, if you wish, we will furnish a unit of proper size for you to test as a basis for determining whether or not you wish to purchase it.

PLEASE tell us make, model, HP, amount of lube oil in each engine, voltage available and whether AC or DC. Also state gallons of other oils drained from trucks, autos, ice machines, etc., per month, available for reclamation.

**YOUNGSTOWN
MILLER CO., Inc.
SANDUSKY, OHIO**

The facts are yours for the asking . . . Please mention Diesel Progress in your inquiry



ALSO BUILT IN MARINE MODELS

These two De Luxe Models were specified by the architects to serve the new G.M. Winton Diesels on Moran's two 1,000 HP. Diesel Electric Tow Boats now nearing completion at the Defoe Boat Works, Bay City, Michigan.

NEW DEVELOPMENTS

WHILE the construction details of the various types of fuel pumps in use vary, they may be divided into two classes, namely, multi-unit pumps and single-unit pumps. Multi-unit pumps are compact but require—in the case of large engines—long pipe lines, which, due to the high pressure they have to withstand, are sometimes troublesome.

Single units, on the other hand, can be placed

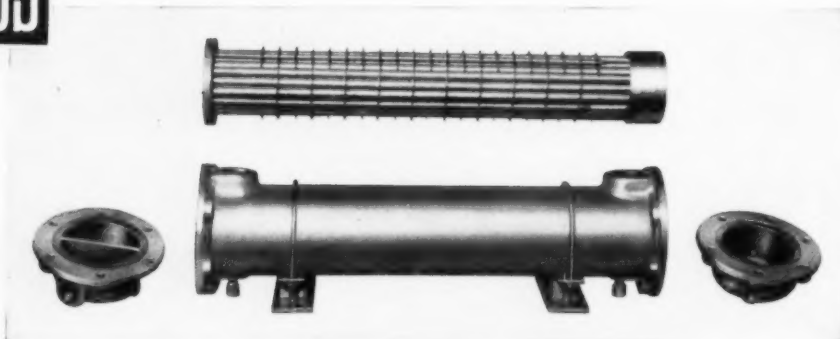
directly adjacent to each cylinder of an engine; thus, the high pressure lines can readily be very short indeed. But these single units too are troublesome, since the various units must be connected to a feeder line supplying the fuel. While these feeders are low pressure rather than high pressure lines, nevertheless, the large number of pipe joints are delicate and thread stripping sometimes results due to careless handling. Yet, single unit pumps have and are finding

favor because faulty units may easily be replaced, should such an occasion arise.

The shortcomings of single unit pumps have been overcome by a foreign manufacturer in a novel way. As may be seen in the illustration, each pump unit contains an inlet flow (16) and a return flow (15) in the base flange which holds the pump unit to the engine proper. The pump unit flange is held by the usual studs and

ROSS

TYPE "CP" COOLER WITH TUBE BUNDLE WITHDRAWN, SHOWING CONSTRUCTION OF PACKED FLOATING HEAD AND TUBE BUNDLE ASSEMBLY.



Lube oil sludge forms at 180° in Diesel Engines . . .

- When lube oil heats above 180°, oxidation takes place forming troublesome sludge. Equally harmful is the loss of viscosity when the temperature increases, leaving a thin oil of inadequate film.
- In Diesel engines, the most effective and safest operating temperatures for lube oil are between 130° and 160°.
- Ross Standard "CP" Coolers, because of an exceptionally large cooling surface, are unexcelled in their dependability for keeping the lube oil at required temperatures. That is why leading Diesel engine manufacturers use them on original installations.

WRITE FOR THE ROSS "CP" BULLETIN NO. 3622 explaining and illustrating the application and design of Ross coolers, their capacities, sizes, special uses as jacket water coolers, quenching oil coolers, general oil-liquid coolers, and other important information.



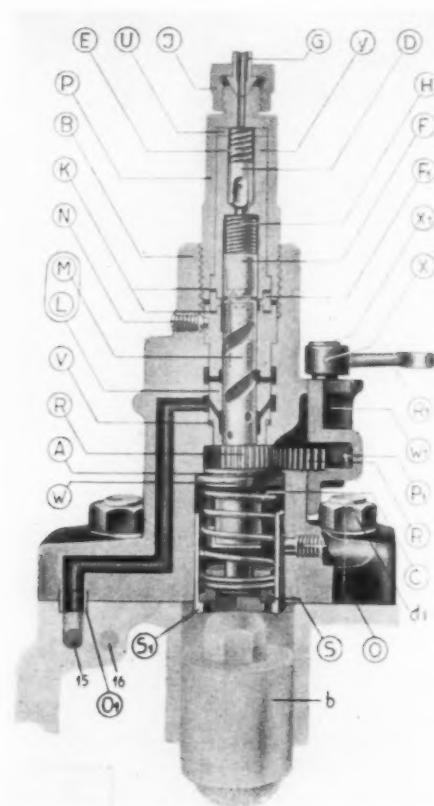
ROSS HEATER & MFG. COMPANY, INC.

DIVISION OF AMERICAN RADIATOR AND STANDARD SANITARY CORP.

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nuts, and the latter are sufficiently husky so that thread stripping is not likely to occur. A fuel feed line as well as a return line for the excess fuel (bleed) is drilled directly into the engine's crankcase. These two lines connect with the holes (16) and (15) drilled into each pump unit base and when the latter is placed over its operating cam and tightened down by means of the studs, a simple and absolutely trouble-free connection is made with both the feeder and bleeder lines. The high pressure pipe lines from the pump units to the injection nozzles may be as short as desired inasmuch as the pump units can be mounted high-up on each cylinder. The control arms (x) of the various pump units may be connected by a bar which in turn is connected to the governor so as to maintain a uniform engine speed.

TEN MILLION DOLLARS

Diesel Engines and Accessories Ordered in Past Sixty Days

VARIOUS U.S. Government departments have, within the past sixty days, ordered in excess of ten million dollars worth of Diesel engines and accessories for marine service alone. Other departments are preparing to order directly or indirectly another seven million dollars worth.

The ten million dollar total of actual engines on order is made up as follows—Six submarines recently placed, machinery for which will be supplied by General Motors Corp. for three subs and Fairbanks-Morse for the other three—total value of Diesel machinery, \$5,500,000.

The ten Class "C" cargo carriers recently placed by the Maritime Commission—four to Tampa Shipyard with Nordberg Diesels and six to Sun Shipbuilding & Dry Dock Co. with Sun Doxford Diesels, will require some \$4,750,000 worth of main engines and auxiliaries.

In addition to these two big contracts, miscellaneous contracts, such as the two Coast Guard now being built by Defoe; the three Navy Tugs (incidentally all five of these tugs are Diesel electric drive); two survey boats; a 65-foot tug in Philadelphia and four other smaller vessels—these smaller jobs call for a half a million dollars worth of Diesel machinery.

All in all, a lot of Diesel machinery has been ordered from Washington within the last few weeks and more will be ordered. These orders have been spread around—Fairbanks-Morse, General Motors, Superior, Union Diesel, Caterpillar, Nordberg and Sun Ship, with some of the auxiliary engines going to Cooper-Bessemer, a nice, chunky order in itself.

As these orders have reached the engine builders the effect of them has been felt by the accessory manufacturers and once again the Diesel industry is the first to start pulling out of a depression.

The whole industry is feeling the effect of improved business, of a rapidly increasing demand for Diesel engines. Cummins has picked up some splendid business in the past sixty days. Worthington plant is working at better than 80 per cent capacity. Superior plants are doing much better—and so the story goes.

There IS business if you will dig for it—now. As this is written the Navy Department opened bids for three fleet tugs and machinery for a Submarine tender—over two and a half million dollars worth of Diesel machinery. American

Locomotive were low bidder on the Submarine tender, \$1,746,000, and Bethlehem Ship low bidder on the three tugs, will probably use either Alco or General Motors engines—machinery value about \$750,000.



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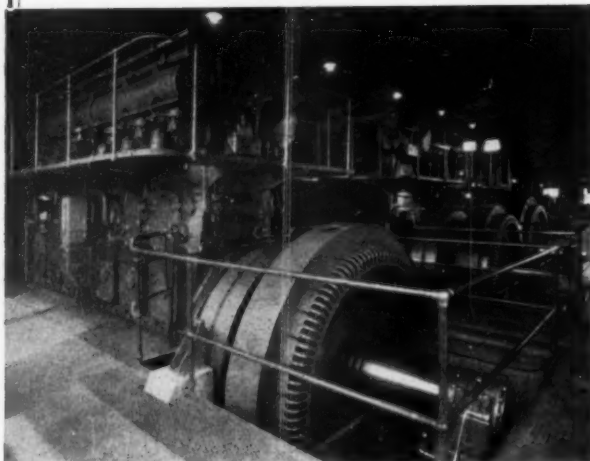
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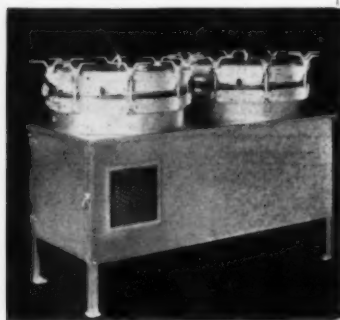
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SYSTEMATIC LOCATION OF DIESEL ENGINE TROUBLES

THE increasing use of automotive Diesel engines and the numerous applications of small and medium powered engines operating on the compression ignition principle, to industrial uses as well as for transportation makes this new chart a particularly timely publication. It is intended for shop, school and garage use and is a valuable guide to Diesel engine trouble shooting. The chart has sectional views, longitudinal and transverse, of a typical modern light Diesel engine as well as diagrams of a fuel supply system, including the feed pump, the injection pump and the fuel injector. The type is large, clear and easily read.

All mechanical parts are clearly indicated by arrows and named and the accompanying tabular matter summarizes the various defects apt to occur, the symptoms that indicate the defective condition and the remedy for the trouble. To make the search easy for the mechanic, the troubles are summarized under easily recognized faulty action such as lost power, hard starting, misfiring, noisy operation, reasons for different color of exhaust smoke, etc. As the Diesel engine differs materially in operating principle from gasoline engines, such a chart should prove useful in all shops and garages catering to both types. It is also excellent for vocational and trade schools and the general mechanic.

A wall chart arranged by Victor W. Page, M.S.A.E., size 25" x 38" and printed in two colors, may be obtained from DIESEL PROGRESS, 2 West 45th Street, New York, N. Y. Price 50c.

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A GROUP of three gentlemen representing Messrs. Sulzer Brothers, Winterthur, are visiting large industrial, engineering, and technical shops in this country. Mr. Frederic Oederlin is a member of the Executive Committee of Sulzer Brothers and in charge of the direction of technical developments, research, and engineering planning. Mr. George Sulzer is particularly interested in the sales activities of the Sulzer concern. Dr. Herbert Wolfer is particularly interested in the design and construction activities of Sulzer Brothers.

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ATLAS DIESEL OPENS CHICAGO OFFICE

THE Atlas Imperial Engine Co. of Oakland, California, has recently opened its Central Division Sales Office in the Builders Exchange, 228 North LaSalle Street, Chicago, Illinois, according to an announcement by F. H. Kilberry, President of the concern.

Mr. F. H. Dickson, formerly manager of the Diesel Division of Fairbanks, Morse Company, will be in charge of sales of the company's regular line of marine, stationary, industrial and oil field Diesels. Mr. Dickson will be assisted by Mr. A. H. Braunsdorff and Mr. A. A. Bauer, formerly with the sales department of the Atlas Eastern Factory at Mattoon, Illinois.

Mr. J. R. Watson, formerly manager of the Mattoon factory, will also make his headquarters at the Chicago office and will devote his efforts to the introduction of the ATLASCO electric fuel injection and ignition systems which the company has developed during the course of the past five years. These systems are to become available on new engines only, and no attempt will be made to sell or adapt them to gasoline engines now in service.

THE Atlas Imperial Diesel Engine Co. of Oakland, California and the Buda Company of Harvey, Illinois have just concluded an agreement under the terms of which the Atlas Company becomes distributor for Buda marine engines on the entire Pacific Coast and at the Atlas Factory branch at Houston, according to an announcement by F. H. Kilberry, President of the Atlas Company.

"The Atlas Company," says Mr. Kilberry "has long been a recognized leader in the design and distribution of slow-speed, heavy-duty Diesels which are noted for their dependability and economy in fishing boats, tugs, tankers and various other types of work boats. We have long recognized a substantial market in the pleasure craft and in smaller work boats which were outside our regular line of engines.

"The Buda line of marine engines serves to round out our own service to the marine industry and permits us to meet the power requirements of the smaller, lighter, and shallow draft vessels, and other types of craft in intermittent service. Since The Buda Company has attained wide distribution in the automotive, portable, and stationary fields, the advantages accruing from mass production economies in the manufacture of the majority of parts is reflected in lower prices to the purchaser.

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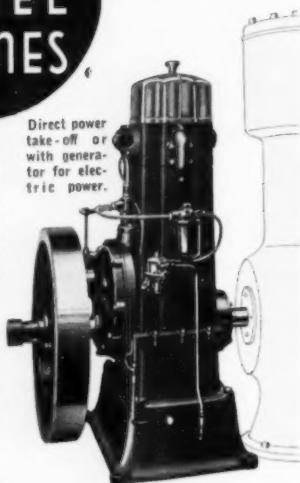
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S. A. E. NEWS

Topping all other technical sessions in attendance, the two Diesel sessions at the Summer Meeting of the Society of Automotive Engineers, White Sulphur Springs, W. Va., June 12-17, evidenced the growing interest in this vital branch of the Society's work.

Impressed by the extreme interchangeability of parts on the line of General Motors Diesels, as brought out by F. G. Shoemaker of General Motors at the SAE Summer Meeting, one discussor suggested that "the line could be included very nicely in an 'Erector' set." Mr. Shoemaker presented a step-by-step account of the design and development work behind the G.M. automotive Diesels.

Specifications for eight Diesel engines that either are actually being fitted into stock European passenger cars, or are recommended for the purpose, were revealed by P. M. Heldt of *Automotive Industries*. That the two-stroke cycle is in the ascendancy in European Diesel engine development, was another conclusion reported by Mr. Heldt in his SAE Summer Meeting paper.

How a resourceful salesman of four-cycle Diesels outwitted his two-cycle competitor and closed a sale with a city council in a Western State was one of the humorous stories of merchandising and servicing Diesels in the field told by C. G. A. Rosen of Caterpillar Tractor at the final Diesel session of the SAE Summer Meeting. "The two-cycle engine," the salesman explained, "is a serious liability because, if one cycle is impaired, the other has too small reserve capacity to rely on whereas, with four cycles, the loss of one cycle still leaves three in the bag."

The most striking improvements in lubricating oils for automotive Diesels have been obtained with soap-type additives, contended Dr. Ulric B. Bray of Union Oil Co. of Calif., the fourth Diesel speaker at the SAE Summer Meeting. With one exception, he explained, all of the properties necessary for Diesel lubrication are exhibited with such oils. The exception is that these lubricants are corrosive to the newer alloy-type of bearings, he pointed out, although he predicted early development of an all-purpose non-corrosive oil.

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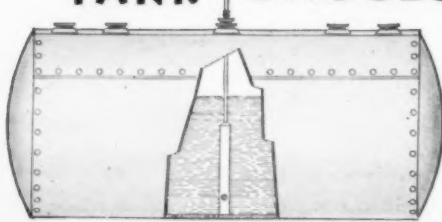
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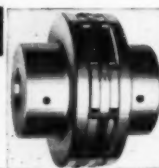


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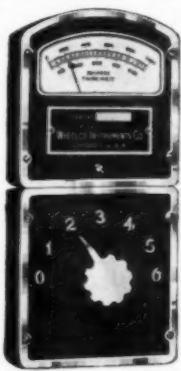
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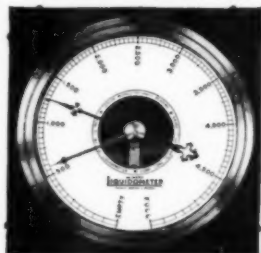
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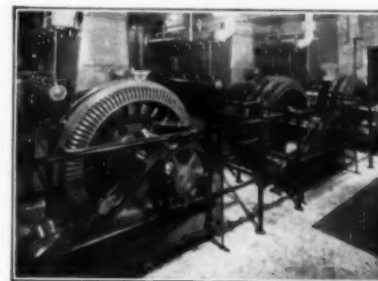
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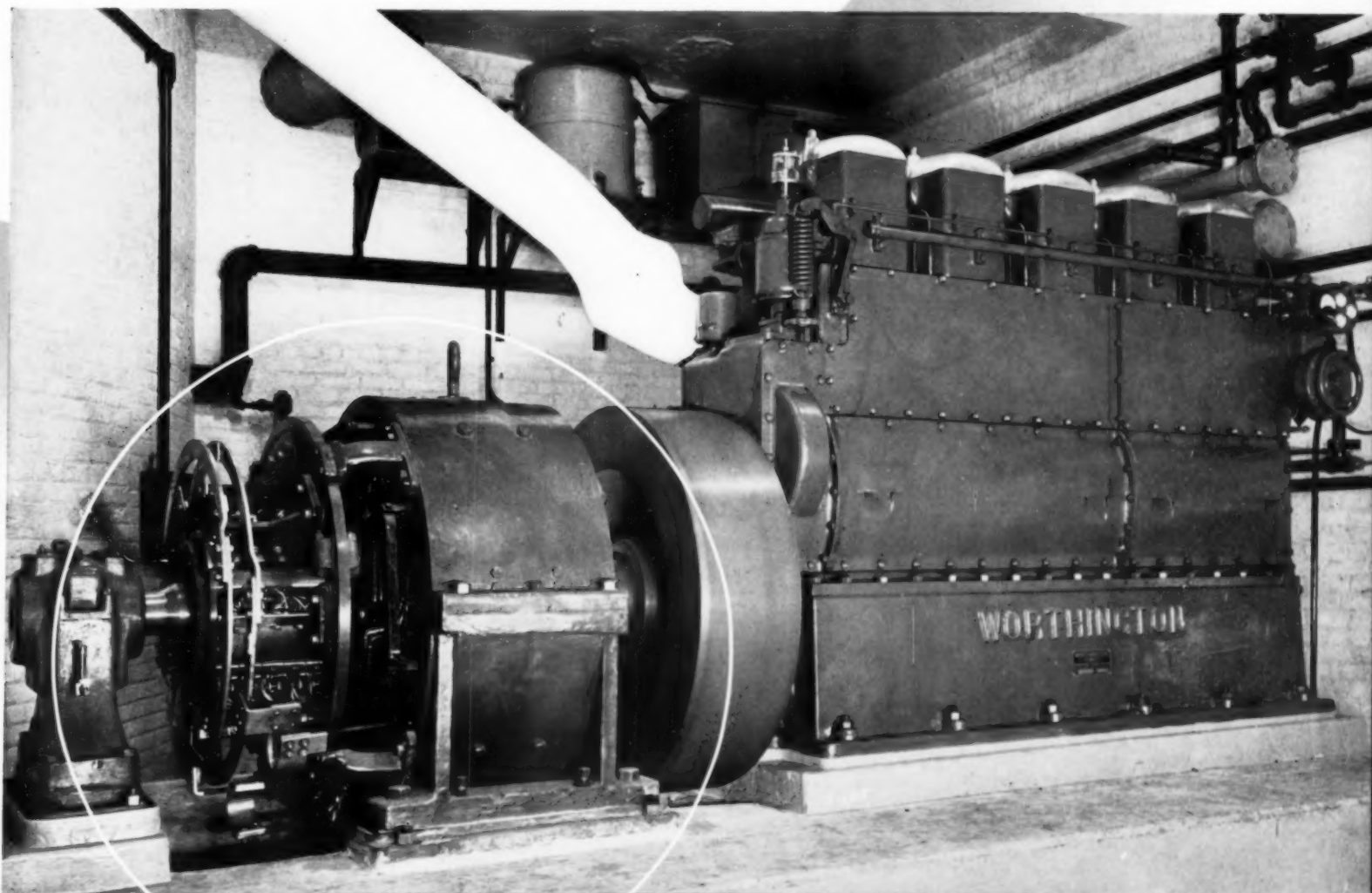
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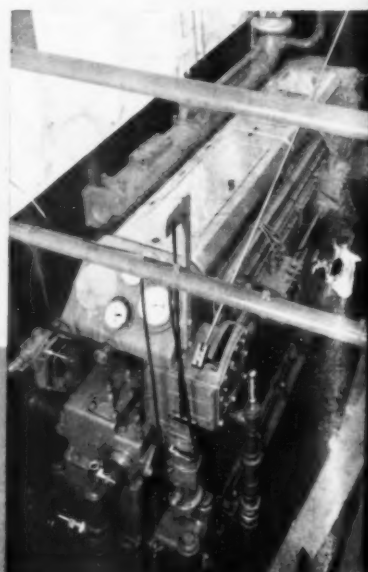
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